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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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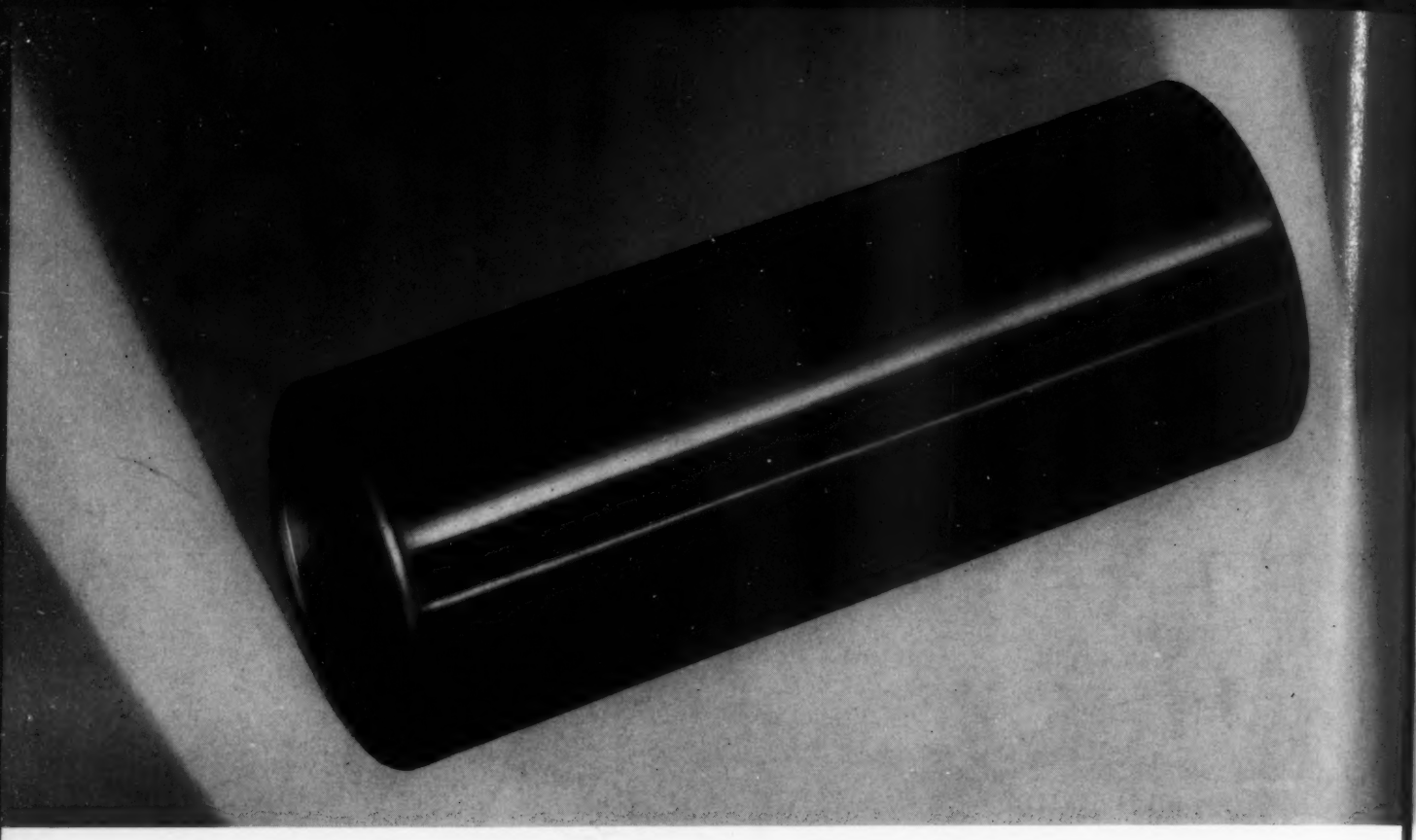

Portrait of a Mind...one day old...

THE brain of a child at birth is as clean and free of impressions as a new wax cylinder for a dictating machine. And just as a wax cylinder can reproduce only the words that have been "dictated" on to it, so the mind of man can work and create only with the thoughts, ideas and ideals that have been "written" there from without.

It is well-known that the impressions made on an individual during his childhood and youth are deepest of all, nearly impossible to eradicate, and influencing if not entirely controlling all that the individual does in his adult life. In these early years his habits of thought and action are formed. As we march forward into the future with the knowledge that new and stranger forces and facts and relationships will arise to confront the men of tomorrow, we *know* how important those early impressions are. As we think how our youngsters must learn to stand on their own feet, rely on the sinew and endurance and courage of their own thinking, we *know* that we must build sound foundations in them *today*.

Every educator worthy of the name knows of this need. And he is constantly asking himself: how can I *better* equip the boys in my care for the responsibilities that face them in the years ahead? How can I give them a sense of the duties they must assume, and an eagerness to face their responsibilities unflinchingly?

Here are lessons not so well taught by words. A sense of values, the power of discrimination, an earnest desire for final honor and honesty . . . all the qualities which give character and sinew to a boy's mind are best taught by quiet precept and example. Instructors in drafting seize upon the opportunity presented by drawing instruments to make this lesson vital. For drawing instruments are steps to a career; they are tools of profession; they are instruments by which the honesty of a man's thought can be measured. They are the means by which creative ability is often developed, by which a mind is practiced in judgment and trained in discrimination. They foster the qualities which make their owner a *man*.

This investment in success cannot be treated lightly. Here is one point in a boy's life when he should be encouraged to buy even better than he can afford. The slightly higher cost of the finest drawing instruments is trivial when compared to the immeasurable influence they may have on his career.

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INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

VOL. 30 | MAY, 1941 | Number 5

REQUISITIONS

The May issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION again calls attention to the fact that requisition time is here. The month of May is admirably suited for determining future needs as far as materials and supplies are concerned, and also for planning the making of needed repairs, and for ordering new equipment.

This phase of the shop instructor's work is of more importance this year than it has been for many years in the past. Because of present-day conditions due to the Defense Program, it may take months before equipment can be obtained. It is best to make decisions now and get the requisitions started on their way.

SUMMER SCHOOL

Summer vacations are in the offing. Many of our readers have already made their plans. Others are still undecided. Of course, a large number of forward-looking instructors of industrial arts and vocational education are planning to attend summer school.

In order to assist these teachers, the following teacher-training institutions are listed. Their statements as to summer-course offerings may be found in the advertising sections of the March, April, and May issues of this magazine.

BRADLEY POLYTECHNIC INSTITUTE, Peoria, Ill., June 10–July 18; July 19–August 23.

KANSAS STATE TEACHERS COLLEGE, Pittsburg, Kans., June 2–August 1.

OREGON STATE COLLEGE, Corvallis, Ore., Summer Session, June 23–August 1; Second Session, August 1–August 30.

PENNSYLVANIA STATE COLLEGE, State College, Pa., Inter-Session, June 10–27; Main Session, June 30–August 8; Post-Session, August 11–29.

STATE COLLEGE OF WASHINGTON, Pullman, Wash., June 23–August 15.

THE STOUT INSTITUTE, Menomonie, Wis., June 23–August 1.

TEACHERS COLLEGE, COLUMBIA UNIVERSITY, New York, N. Y., July 7–August 15.

UNIVERSITY OF MINNESOTA, Minneapolis, Minn., June 16–July 25; July 28–August 29.

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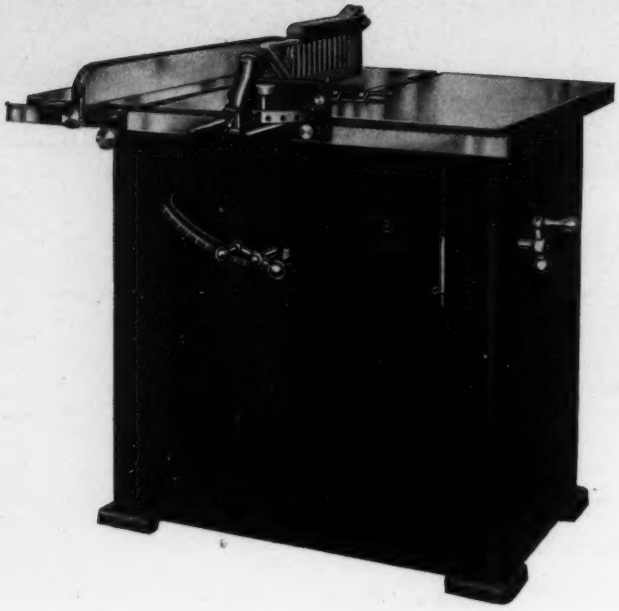

J-25
CIRCULAR SAW

The Last Word in Circular Saws. That just about describes the J-25 perfectly. Newest member of Yates-American's well-known J-Line, this 10 inch tilting arbor circular saw is now offered to the school field after a long period of testing under the most severe operating conditions. We make no extravagant claims for this saw but feel confident that its performance will continue to establish an excellent reputation for it.

Direct Motor Drive

Because the motor is mounted directly on the arbor the saw is extremely quiet in operation . . . a distinct advantage in large school shops. The motor is also totally enclosed, fan-cooled, dustproof and controlled by a push button starter. A welded steel frame encloses all working parts . . . no extra housings are needed. Saw dust can be collected in the base or a connection to your exhaust system can be readily made. Two doors provide easy access to the interior.

Generous Capacity Throughout

This saw is *full size* in every respect. It will cut stock up to 2¼" thick . . . will rip to center of 38" stock without extensions . . . to the center of 50" stock with extensions. Cut-off capacity is 17" . . . 25" when front table extensions are used. Extensions, however, are seldom necessary because of the unusually large table size—32" x 36".

The J-25 Saw comes fully equipped with a dual-pivot saw guard, improved mitre gauge, cast-iron rip fence and front table extensions. Get complete information about this better saw. Write now!

YATES-AMERICAN MACHINE COMPANY • BELOIT, WISCONSIN

Short Talks on Wood

BEECH (*Fagus grandifolia*)

The tree itself is generally considered the most beautiful of the hardwoods. The wood is close-grained and uniform in texture. It is heavy, hard and strong. Not durable in contact with soil. Difficult to season. Readily polished.

Because it is strong, and also odorless and tasteless it is widely employed in the manufacture of boxes, crates and baskets. Also used to some extent for furniture, flooring and railroad ties. An excellent fuelwood. The terms red beech and white beech designate the color of the wood rather than different species.

Beech grows throughout eastern United States from Maine west to Lake Superior and south to Florida and Texas. Most abundant in New England, New York and Pennsylvania. Will grow in almost any type of soil but seems to prefer moist, cool upland soils. Endures extreme shade.

Grows to a height of 45 to 100 feet, and a diameter of 1½ to 3 feet. In the open the tree has a broad, compact head with spreading, drooping branches.

The bark is smooth, hard, and steel-grey. Its smooth surface is a constant temptation to the owner of a jackknife, in fact, for that reason the beech is often called the "initial tree". The leaves are simple, alternate, 3 to 4 inches long, smooth, thin, oval and coarsely toothed. It bears small, brown edible nuts which usually form in pairs and are enclosed in a prickly burr.

To date, twenty-five brief articles similar to the one above and dealing with the more commonly used woods have appeared in these ads. As in the past, we continue to invite your suggestions as to the species of wood you would like featured in this series.

YATES-AMERICAN

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

Contributions of Industrial Arts to Industry and to National Defense*

F. THEODORE STRUCK[1]

We are living in days when an unusually great challenge rests upon teachers and school administrators. The task before us may be broadly stated as that of cooperating with others in safeguarding, improving, and perpetuating the free American ways of life. Toward that vital end we need to make sure that the public schools are doing the best job that it is possible for them to do in all areas of instruction.

It is our purpose to throw the spotlight of inquiry upon industrial-arts education. We want to know whether or not industrial-arts education is making significant contributions to modern industry and national defense.

Developing Understanding

Modern industry, first of all, needs workers who have a sane viewpoint toward those who work in overalls. Industry is looking for persons who like to use their hands as well as their heads; persons who get satisfaction out of working with tools, machines, and materials of manufacture and construction.

The best way to secure an appreciative understanding of industry is to work in industry. The next best way is to get representative industrial experiences in school shops or laboratories. Under present conditions, the age for entering employment has been raised to the point where many do not have the opportunity to develop valuable work habits that call for physical effort and perspiration, until they are 18 years of age and are thinking seriously of marriage.

There are distinct social hazards in postponing the development of practical work habits until 16 or 18 years of age. Young people who have not had the opportunity before that time to learn to love strenuous physical work, and to develop creative abilities centered around the world's industrial work, may get the false notion that white-collar jobs are socially more worthy, and more satisfying than blue-collar jobs.

It is in this general direction that progressive teachers of industrial-arts education are making distinct contributions, through well-selected, representative industrial experiences, supplemented by trips to industries, by slides, film strips, movies, and the study of problems related to representative, manipulative industrial experiences.

Developing Attitudes

This matter of developing wholesome attitudes toward all socially useful work, and especially that large proportion of our people who earn their living by the sweat of their brows, is something that must not be overlooked.

Those who at an early age learn the deep-rooted satisfactions that come through ability to handle tools and materials of construction, get experiences that help to mold, not only occupational interests and vocational choices, but the larger, broader outlook upon life. At a time when extensive inquiries such as Howard M. Bell's *Youth Tell Their Story*, and the *Regents' Inquiry* and others show that from 20 to 70 per cent of high school graduates want to get into professional and technical jobs, whereas only 7 or 8 per cent of the gainfully employed people in America are employed in the professions, it is particularly appropriate to give to emerging youth, those industrial-exploratory and self-finding experiences that come under the head of industrial-arts education.

It is well to face the facts of occupational life and of modern industry. Employers prefer young men who have wholesome, constructive, problem-solving attitudes toward industry. They need young men who look with enthusiasm and eagerness toward a lifework in industry — not young persons who enter industry disgruntled because they were taught that white-collar jobs are the only ones worth having. Through industrial arts, young people are being taught to regard highly those who work skillfully in industry. When it comes to choosing their own niche in the world of work, students thus instructed welcome jobs in industry because they have learned that a young man's chances to rise and advance are as good through the overall route as through the white-collar route.

Developing Habits of Work

In many instances, especially in the case of city-reared youth, young people get their first chance to develop useful physical skills in industrial-arts laboratories. It is here that they first learn to work strenuously, creatively, and cooperatively on projects that call for sustained manual work. These habits of using common materials and tools, and of working constructively in cooperation with others, represents not only worth-while pre-employment training and habit formation useful in modern industry, but experiences that are valuable toward preserving and perpetuating democracy in a war-torn and distracted world.

Furthermore, this work provides some of the most unifying, educative, and integrative of life's experiences. Work habits formed in the plastic days of youth are not easily cast aside. As a nation we stand upon the threshold of an era when we must strive cooperatively to replace unemployment with universal employment — an era when useful work habits of the democratic sort must be established as a means of protecting the freedoms we love and the homes we cherish. Through developing work habits in youth, industrial-arts teachers are rendering yeoman service to the cause of national defense. The ramparts we defend are not so far from the schoolroom and the school laboratory as some folks think.

*Address given at the American Vocational Association Convention, San Francisco, Calif., Dec. 16, 1940.

[1]The Pennsylvania State College, State College, Pa.

Representative Work Experiences

Even though the objectives of industrial arts are different from those of vocational industrial education, there is a commonality in their contribution to industry. This could be represented graphically by the overlapping portion of two circular areas each of which cuts into the other. The representative work experiences acquired in industrial arts on the junior high school level form a good foundation for similar ones given later on a more intensive basis in trade or industrial classes, or in the world of industry and manufacture.

It is generally recognized that the quality of craftsmanship, seen in the better industrial-arts projects, compares favorably with much of that found in projects completed in vocational classes. The fact that industrial arts serves broadly motivational, recreational, and guidance purposes, does not prevent such instruction from embracing work experiences that are useful to industry and to national security.

Helpful to Specialized Workers

Specialization and mass production are typical of modern industry. In many manufacturing establishments, 25 to 85 per cent of the workers earn their living at highly specialized, repetitive jobs. What kinds of instruction can the schools give that will make persons more employable and more valuable in this extensive, highly specialized, more or less routine class of work? It is true that a prospective worker can be taught to do a specialized job most quickly by having intensive, specialized training in the operations involved. This must often be done in industry since the schools cannot duplicate the equipment found in industry, and since the schools do not have the funds to prepare large numbers of persons for semiskilled jobs through special classes.

From a practical point of view, well-organized and efficiently taught industrial-arts education, given on the junior and senior high school levels, is as valuable for workers and prospective workers in highly specialized industrial jobs, as anything the schools can provide. There are two reasons for taking this view. First, such workers do not know in advance in which of many kinds of highly specialized jobs they will find employment. Consequently, diversified and representative experiences such as are, or may be, taught in industrial-arts laboratories are more likely to function effectively than would extensive training in one occupation. Second, the turnover in these specialized employments is high. We are faced not only with the problem of initial training, but with that of retraining for successive employment, the job requirements for which differ from those of the preceding job. Again, diversified, representative instruction with commonly used materials, tools, and machines, such as may be given to unemployed semiskilled workers in afternoon, evening, or night classes in industrial-arts shops, offer a practical method of approach. It is not that such instruction could not be given to unemployed specialized workers in vocational schools or classes, if the latter were available.

Background for Skilled Workers

By the time students have completed their work in industrial arts, they will have built up a background of insights, understandings, and skills that form a relatively broad background for more specialized trade training. This broad background helps skilled workers in industry to understand and appreciate the nature of the work, and the contributions made by other workers. This better understanding is conducive to cooperation and effective group action. In this way industrial-arts education serves a useful purpose to modern industry and toward the broad goal of improving our social order by intelligent, cooperative effort in which all citizens should participate.

Under former conditions, many specialized workers received trade extension instruction in the public schools. Under present circumstances, that program has been expanded considerably. But in the light of conditions we are facing today, and likely to face tomorrow, it appears to be highly desirable to use to the full both industrial-arts and vocational-industrial education facilities.

Something of the range of this background may be inferred from the scope of such representative industrial-arts experiences as these: disassembling and assembling automobile parts; studying the mechanics of automobiles; shop sketching; blueprint reading; scale drawing; electric wiring; studying the electric Underwriters' rules and regulations, and electric communications.

Other units include electric theory, motors and generators, machine-shop practice, sheet-metal work, art metalwork, forging, welding, metal molding, pipe fitting, and plumbing. In the area of the graphic arts there are units of work in composition, presswork, bookbinding, and art applied to printing. In the area of woodwork, students learn something about carpentry, cabinetmaking, and pattern-making.

Among the materials used are wood, leather, textiles, plastics, clays, fibers, iron, steel, brass, zinc, stainless steel, glass, copper, rubber, aluminum, pewter, silver, and semiprecious stones. While this is but a partial list, it will illustrate definitely how industrial-arts education provides a worth-while background for workers in industry.

Teaching Safety

According to the National Safety Council, safety means more than accident prevention. It means the conservation of all that goes to make life worth while — health, opportunity, and the material resources upon which life itself depends. Safety is a matter of heart as well as of head. There must, first of all, be a respect for, and an appreciation of, the rights of others. Underlying methods of teaching safety there should be the basic concepts of safety. Attitudes and ideals have a part in reducing accidents. But why mention these matters in connection with our topic? Because it has been proved that teachers of industrial arts can do much to reduce accidents in school shops and in industry through well-planned safety instruction. Good shop teachers make the teaching of safety concepts and safety practices in a thorough, painstaking, effective manner, an important part of their work.

In industrial-arts shops pupils learn how to store and handle volatile lacquers and other finishing materials, how to operate tools and machines with safety, when to use goggles, how to prevent spontaneous combustion, how to lift heavy burdens in a manner that will reduce the hazard of rupture, and how to protect health through proper sanitation. These and many other things are taught daily in industrial-arts classes. The things thus taught represent, in the aggregate, a considerable body of learning that helps modern industries to keep their accidents down to the minimum.

Mental and Physical Health

Modern industry must find more ways and means of enabling its workers to conserve mental and physical health. Men and women who work at highly specialized operations find it hard to develop and keep the same outlook and enthusiasm for their jobs as do craftsmen, artists, and other creative workers. It is quite impossible for industry to provide creative work for large numbers of workers. Under such commonly existing conditions, the solution lies in getting, during nonworking hours, opportunities for creative expression that will offset and compensate for the deadening routine of daily work that must be done.

It is precisely here where industrial arts can render outstanding service. By organizing late afternoon and evening classes for employed adults, the schools, through their industrial-arts laboratories, may make a notable contribution toward furthering mental and physical health. The strain and stress of employment is perhaps unavoidable. But we can overcome some of its enervating effects by making provision for adults in energizing, health-giving, creative, industrial-arts activities under school auspices. This will cost something, but nothing to be compared with doctors' bills, shortened occupational life, and maintaining hospitals for the mentally ill. It is claimed that every third bed in our hospitals is occupied by persons who are suffering from mental illness. It costs no more to employ an industrial-arts teacher an evening per week, who will take care of a group of 20 adults, than it does to maintain a single patient in a hospital for

24 hours. Recreational, health-giving, mentally stimulating industrial-arts instruction centered around interesting, creative projects, is what many adults need greatly. When employers and the general public realize this to be true, they will see to it that industrial-arts shops in schools are operated for adults as well as for young people.

The Home Workshop

Teachers of industrial arts may be of considerable help to persons employed in modern industry, by assisting them in establishing little home workshops for leisure, hobby, and recreational activities. Teachers may assist men and women in selecting equipment that will best serve their purposes, materials that are appropriate, and perhaps suggest sources of information that will be helpful.

Such home shops must often be very simple. Sometimes a little workbench is placed in the basement, or in an attic. The September, 1936, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION carried a good article by Ross C. Cramlet and William F. Hunter on "The Home Work Shop Organization."

Developing Resourcefulness with Tools

In this machine age, power age, and air age in which we live, there are many occasions when resourcefulness with tools and materials of construction are exceedingly helpful. The ability to use tools cleverly, artistically, and withal effectively, is learned through extended experiences. The initial experiences in working resourcefully with tools, materials, and industrial processes, as learned in industrial-arts classes, may and often does come to fruition some years later when the student works in industrial occupations. In this sense, industrial-arts education in the secondary schools of America becomes a significant part of the well-known American resourcefulness, and initiative for which our major industries are famous.

In summary, we have thrown the searchlight of inquiry upon industrial-arts education to see what it has to offer to modern industrial needs, and to those of national defense. We have attempted to show that progressive industrial-arts instruction makes 10 important contributions in the directions mentioned. These are:

1. Through industrial-arts education, an appreciative understanding is secured of the vast, extensive, and complex world of work.
2. Industrial-arts education serves excellently as a means of instilling and developing highly important attitudes about life, and more specifically about the democratic ways of life.
3. Through industrial-arts education many young people secure their first opportunities to develop work habits that will deepen and strengthen with the years.
4. Industrial-arts experiences are valuable because they are representative of actual life.
5. Industrial-arts education is probably the most desirable form of school instruction whereby highly specialized workers may be helped to secure and hold many forms of semiskilled jobs.
6. Backgrounds and foundations are important. Industrial-arts education provides a rich, varied, and functional background of later work in industry.
7. Safety concepts, and safety practices, are learned effectively in school shops.
8. Creative industrial-arts experiences are directly helpful in furthering mental and physical health, both of which are vital to modern industry and to national defense.
9. Teachers of industrial arts have the opportunity to help employed industrial workers and other adults by assisting them to plan and equip small, inexpensive home workshops where creative hobby or leisure-time activities of the crafts variety may be undertaken.
10. Resourcefulness and skillfulness with tools and industrial materials, both of which are much needed in this fast-moving machine age, frequently have their origin in industrial-arts classes, and reach their greatest development in adult life in industry.

In closing and by way of general summary, it may be said that industrial-arts education, properly taught, provides a valuable background and initial training that contributes effectively to present-day needs of modern industry, and to national security.

The Public School and Industry in National Defense Training[1]

HENRY J. ROESCH*

For the second time in the lives of most of us assembled here, the world is again at war. Many nations are putting forth every effort, and expending all their resources to destroy each other. Mortal fear, starvation, and untold hardships including disease, injury, and death, are the harvest being reaped by the nationals of European countries.

Battles are being fought in Asia, Africa, and Europe. Other nations in other continents are putting their all into building materials of destruction.

For the past two years, we in America, have learned through the means of radio, newspapers, magazines, and motion pictures, how terrific destruction and death have been visited upon the weak. We have been told that only the strong shall survive. There is no doubt that this lesson has prompted our national leaders to decide that if we are to keep war away from our shores, we must be in position to use the old American custom of "calling the other fellow's bluff."

When an individual or a nation "calls the other fellow's bluff," it must be able to back its stand by a show of power and strength that will be all convincing. Power and strength, back of our army, navy, and air force, are our assurance of maintaining our place in the savage world of today.

In the opinion of some military experts, modern battles are decided in the machine shops, foundries, and engineering laboratories of the nation. This is a mechanical war. These military experts further contend that a nation which is supreme in the air, can control the land and seas. Our national leaders have decided that we, as a nation, must become supreme in aerial attack and defense. This is a tremendous task, and it must have the support of every phase of our economic life.

The Task Confronting Education and Industry

Let us now look at this gigantic task and see how you in the educational field and we in the industrial field can help to do this job.

The aircraft industry in America has had suddenly thrust upon it the job of equipping this nation for aerial warfare. Overnight this industry has been called upon to expand to the point where it will rival, in point of numbers employed on production lines, the gigantic automobile industry which has developed over the past quarter of a century.

Aviation engineers and designers have developed plans for the finest planes which have been built up today. In order to carry out these plans, huge factories have been and are being built, machinery has been

*Director of Industrial Relations, Briggs Manufacturing Co., Detroit, Mich.

[1]Address given at the Michigan Industrial Education Society, Grand Rapids, Mich., March, 1941.

designed and is now being built and put into place in production lines, raw materials are being gathered and sent to production points for manufacture into finished products.

Man power is being recruited to build planes, tanks, ships, ammunition, rifles, guns, cannons; and to provide food, clothing, and shelter for the four million men who will be trained for military combat in this country within the next four years.

Our joint task is the training of this man power for industry and later for the armed forces. We have learned that the bottleneck in England's defense has been its lack of skilled technicians and mechanics. That will be and is now our bottleneck. We jointly must make that bottleneck change into a funnel which will feed into industry men trained in specific jobs before and during employment in a defense industry.

In order to solve any problem we must know what it consists of. Looking at the industrial picture we find:

1. A shortage of men trained in designing and detailing of designs.
2. A shortage of men trained to interpret these designs into tools, dies, jigs, and fixtures to facilitate production of instruments of war.
3. A shortage of men trained in assembling fabricated parts into subassemblies.
4. A shortage of men trained in machine operating and final assemblies.
5. A shortage of men trained to inspect these completed parts so as to be sure they meet specifications.
6. A shortage of men who will lead and supervise the man power before mentioned.

In order that you may appreciate the size of this problem we, in Detroit, see the need of training in excess of at least 100,000 men in the next 18 months.

How Can the Schools Help Industry?

1. The schools must train men in the technique of teaching. Skilled men must be taught how to impart knowledge to the semiskilled and unskilled. Men must know not only *how* but *why* they do a job.

2. The school's educational staff and facilities must be dovetailed into the particular training need of a specific industrial job whose magnitude justifies it. To illustrate: the Detroit Board of Education is now training hundreds of men in aircraft riveting for Detroit industries. These men have been and are daily being placed in Detroit plants and are actually building wings for bombers, fighters, and pursuit ships.

3. Toolmakers with intensive training in a short time can do detail tool drafting. One good tool designer in your town can train many toolmakers if he is properly taught to teach.

4. Inspectors can be trained by teaching them blueprint reading and government specifications. One good man in your local industries can train many men in a short period of time.

5. The boys who have in recent years graduated from your local schools can be taught the use of hand tools so that they can enter industry in the lesser skilled jobs. They can be taught the application of fractions and decimals to shopwork. They can be taught simple blueprint reading.

6. Groups of foremen from the smaller plants can be trained to teach as well in the fundamentals of supervision. Industry can furnish these instructors.

7. An inventory should be made of suitable rooms for use in teaching shop mathematics, blueprint reading, inspection technique.

8. An inventory should be made of rooms suitable for teaching bench- and vise work.

9. An inventory should be made of school shop equipment for pre-employment training in machine-tool operations. Teachers for this should be recruited from industry, because they know modern industrial methods.

10. An inventory should be made of rooms suitable for teaching sheet-metal fabrication and layout.

This sort of survey will be an invaluable aid when industry comes to you for assistance. You may ask, will industry come to us? It surely will. We at Briggs have gone to the Detroit Board of Education with these training problems and are gratified with the results.

Related Instruction

Here is how to approach a training problem which industry has presented to the school.

1. Is blueprint reading necessary and how far should it go?
2. Is layout necessary and how far should it go?
3. What shop mathematics is needed for the layout?
4. What measuring instruments are needed and how can their use be best taught?
5. Is elementary chemistry and physics needed and how much?
6. How much must the student know about the use and care of equipment?
7. About the use and care of materials?
8. How can he be best instructed about the hazards of the job? What should he know about the use of safety equipment such as goggles, asbestos gloves, safety shoes, and the like?
9. What must he know about the government standards on the job?

Practical Instruction

1. Layout when necessary. Use of scale dividers and prick punches.
2. Use of electric hand drills and screw drivers.
3. Use of precision measuring tools, size gauges, calipers, and micrometers.
4. Tap and tap drills and their uses. Files, scrapers, and their use.
5. Operation of simple power-driven tools on specific job training.
6. Constant check with industrial coordinators to evaluate the training being given.

The Part of Industry

Industry can do its part in this cooperative plan as follows:

1. It must exhaust the available supply of skilled labor in the community. This can be done through the means of employer associations and the Michigan State Employment Office.

2. Industry should analyze its man power for the purpose of stepping up into higher skilled occupations those who are best qualified to do so. It should then inform the school what the specific needs of the persons stepped up really are, so that the school may cooperate in developing the necessary skill and knowledge.

3. On new jobs where a large number of people must be trained, industry can help analyze the job in such a manner as to facilitate a training program. In these cases it must appoint a co-ordinator who will work between industry and school shops to determine the value and progress of the training program.

4. It should select those of its employees who are qualified to train, and together with the school staff, train these people so that they can teach others.

5. Industry *can* and *will* furnish various types of hand tools and measuring tools which are needed in the training.

6. Industry should advise the schools when changes in the training program are necessary as the production progresses to the point where training can be simplified. This will help to train larger numbers in a shorter space of time.

The National Defense Commission has established training panels in various localities whose duty it is to assist industry and education in training men for national defense. The personnel of these panels usually consists of men who are well qualified to advise both industry and education as to the best and shortest method of training in any particular line. The establishment of such panels in the state of Michigan is now in process of formation. Similar panels are being formed all over the United States to tackle this tremendous job. Represented upon these panels are the educational people, men from diversified industries, and representatives of labor. With this type of well-balanced advisory organization, a great deal of good ought to accrue from the pooled experiences of these persons.

Due to the terrific expansion of industry in the defense program and a consequent labor shortage, it is necessary to induct into industrial employment many high school students who have never been employed before. These young men through economic forces, have developed in many instances an attitude which lacks the recognition of their personal responsibility. It is the experience of industry, that they lack the proper attitude toward the responsibilities of their job. It is necessary, then, that their attitudes be changed. They must be sold on the idea that they, as individuals, are as important in our national defense as the man who pilots a

plane, drives a tank, or shoulders a rifle.

They must be made aware of the fact that should a faulty piece of work be covered up, it may tie up a plane factory, a tank factory, a platoon, or a regiment. In order to shoulder this responsibility they must:

1. Understand the importance of the work they do and the part they produce.
2. Put their entire attention on doing the job right.
3. Check their work to avoid errors and delays.
4. Report their mistakes promptly.

They must be taught not to cover up their mistakes.

Only when we have thoroughly impressed these young workers with the importance of their jobs in the present scheme of things, then and then only have we completed our job.

Co-Ordinating National Defense Training

EARL M. BOWLER*

Where schools cooperating in the National Defense Training Program have established specific objectives, co-ordinators can materially aid in the attainment of the goals set. Quality as well as quantity is a factor to be considered when training workers in skills requiring accuracy well beyond that used in pick and shovel, hammer and saw, and allied undertakings. Employee requirements vary from plant to plant, and individuals differ from man to man. This combination of conditions may become so complex in a city of fair size that it would be impossible for a school administrator to cope with all the problems without some special information, guidance, and counsel that a field representative can give.

Local school administrators should recognize the qualities that make for success in a co-ordinator. Wherever possible they should make the necessary additions to their staffs permitting someone to perform the all-important functions necessary to gear their plants to the defense needs of the area. By way of warning it may be said that if schools fail to do this, federal agencies may perform the task for them. Here we should not forget the old saying: "He who pays the fiddler may call the tune." Increases in the staff of the United States Office of Education have put field representatives in the offices of many schools that formerly were rarely if ever visited.

Gearing the school program to the needs of a community engaged in preparing defense items requires the attention of a full-time worker who recognizes the problems of industry and the differences in the make-up of men.

While certain groups and agencies may raise their voices against the training of adults, certain characteristics within the make-up of the individual seeking the training is the most difficult obstacle to be overcome. What these trainees will ultimately be capable of doing — how useful they will be to the government for defense purposes will depend upon how much of their past can be used as a basis upon which to build their future. This situation creates a veritable log jam in a sizable training program — a jam in which only a skilled interviewer can reach the key log for removal. Co-ordinators can move the training forward during the emergency by working out case histories, analyzing the facts, planning courses of study, inducting trainees into the program, and following up the progress being made.

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Information That Must Be Considered

Who besides the co-ordinator is capable of carrying on the necessary investigation that will bring to light information usable in laying out a training program that will bring optimum results in the shortest possible time with the least amount of involved equipment? Who besides the co-ordinator is capable of interpreting the adults's past in terms of the available equipment in the school, the emergency training program objectives (if any have been set up), and the needs or demands of defense industries into which the worker may be fitted? Who besides the co-ordinator knows that because of a certain bend or warp in a prospective trainee's past he will have to travel far from his home environment to overcome the stigma that has become attached to the individual? Who besides the co-ordinator knows what these man-made stigmas are that preclude employment of an otherwise good craftsman in any given locality?

For example take the debt-ridden prospective employee. Employers will not knowingly hire a man who is heavily in debt. A man who is in "too deep" has three strikes against him. The strikes follow this pattern:

1. He is accident prone.
2. He may be more susceptible to industrial disease.
3. He is likely to be involved in legal tangles.

The safety movement has long known that a worried worker is more of a hazard in a plant than a man with a clear mind. Worry leads to daydreaming, woolgathering, and distraction. In carefully guarded plants inattention is the great single cause of accidents. Hence we can account for the accident proneness of the worrying man heavily in debt.

Continuous worry may break a man physically or mentally. Where there is a weakening of any kind, worry will hasten the breaking-down process. Millions of dollars are spent annually on industrial disease cases. What share worry over debt causes is not clear, but debt-ridden employees tend to crack earlier mentally (if not physically) than those free of this worry.

Employers dislike the legal involvements that employee indebtedness brings on. The collector to see the personnel man, the serving of legal papers in the plant, the deductions from pay authorization, and a host of other items are as nettling as they are unnecessary. The man in "too deep" will find the going hard unless he can find ways and means to get something like a fresh start. This is but one of the problems a co-ordinator must have the answer to when the facts are uncovered in an interview with an adult trainee on the defense program.

Worry and Its Consequences on the Job

If one has an eye to the future while cataloging a man's past, what is the co-ordinator's answer to be when he finds:

A former strike breaker training for employment in a field highly unionized locally?

A union secretary taking a "refresher" course for entrance into a plant long known to be an open shop?

A worker who has never been able to hold a job taking a "brush-up" course, when everyone knows that the man has exhausted his possibilities for employment locally?

A man discharged for stealing from his employer seeking entrance to a training program for defense workers?

The town's drunken "best mechanic" seeking training and re-entry into the industries which had turned him out?

The young man whose family provided him with everything including a complete musical education with which he has not

earned his keep, looking for help in getting training that will give him earning power quickly, because he is in need?

A good mechanic starting a "refresher" course when you as co-ordinator know that the man is an alien of questionable background with a record of several arrests for infractions of state or federal laws?

Adult workers have a past. Their future depends upon how the co-ordinator guides them before, during, and after training. Co-ordinators who have been dealing with these personal problems of workers on the Defense Training Program have learned that workers have a present and a future as well as a past. Each of these categories present certain specific problems which are challenging to say the least.

Listed among "present" problems in which employers are likely to manifest an interest, and which co-ordinators are conscious of, in defense trainees are these:

Does he support an extremely large family? Is his wife a "nagger"? Does his wife have "outside interests"? Does the family live beyond its income? Is he "babied" by wife or parents? Does he have "outside interests"? Is he emotionally stable enough for work? Is he mentally fit for work? Is he physically fit to do the work required of him?

What the Employer Should Know

Employers should be made aware of men who are show-offs, horseplay artists, troublemakers, law violators, tattlers, and cheats. If a man has a present as well as a past his prospective employer should be made aware of the uncolored facts in the case.

Every co-ordinated Defense Training Program will have a future. The future will hinge upon how well employees "measure up" to the predictions made by the co-ordinator in placing a worker in employment. When the worker "measures up" on the job in punctuality, dependability, skill, stability, steadfastness of purpose, and a host of other qualities looked for in employees, employers will rate the Defense Training Program "tops." How well the training program succeeds will depend on how well it has been co-ordinated.

Bridgeport National Defense Training Program

T. E. KEYES*

In addition to the aircraft courses in sheet metal and riveting mentioned in the January issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, the Bridgeport, Conn., National Defense Training Program has broadened into far-reaching areas since May 13, 1940, when it started with the three shop instructors loaned to the state by the Vought-Sikorsky Division of the United Aircraft Corp.

Supplementary courses are now given for those working in the trade in addition to the pre-employment courses for the new students. Over 500 students have been absorbed from the training courses in the Bridgeport industries up to the present time. Total enrollment in the defense training courses to date is 1491. Centers for the Bridgeport area are located in Brideport, Conn., at the State Trade School, and the McKinley School, and in Ansonia, Conn., at the Ansonia High School.

Pre-employment courses include aircraft sheet metal, general machine, hand-screw machine, and foundry practice. Supplementary courses are set up to help those now employed and include aircraft sheet metal, aircraft shop mathematics and blueprint reading, aircraft layout and design, general machine, automatic screw machine, metallurgy, foundry mathematics, blueprint reading, automobile mechanics for American Red Cross medical corps, and defense nursing.

Eighteen instructors now are on the teaching staff for the 10-week aircraft sheet-metal course which started May 13, 1940. This course runs from Monday through Friday, 8 a.m. to 5 p.m. In the supplementary course in sheet metal, which runs Monday, Wednesday and Friday, from 6:30 to 9:30 p.m., there are 10 instructors.

The aircraft shop mathematics and blueprint reading courses started October 21, 1940, and now have six instructors. These supplementary courses meet every weekday night from 7:30 to 9:30 p.m.

A supplementary course in aircraft layout and design was started October 15, 1940, and meets Tuesday and Thursday evenings from 7:30 to 9:30 p.m., with four instructors.

All the above courses are in session at the McKinley School branch of the Bridgeport State Trade School. At the Ansonia High School, the Bridgeport National Defense Training Program offers a metallurgy course, meeting on Tuesday evenings from 7 to 9 p.m., with one instructor in charge.

Courses at the McKinley school include: *general machine,* a pre-employment course of 200 hours started February 5, 1940, meeting Monday to Friday inclusive, 12:15 to 7:30 a.m., with five instructors; *general machine,* a supplementary course started November 2, 1940, meeting Saturdays, 8 a.m. to 5:30 p.m., with five instructors; *hand-screw machine,* a pre-employment course of eight weeks started October 7, 1940, meeting Monday through Friday, 8 a.m. to 5 p.m., with two instructors; a similar course started January 6, 1941, with one instructor, meeting Monday through Friday, from 5 p.m. to 12 midnight; *automatic screw machine,* a supplementary course started November 2, 1940, meeting Saturdays from 8 a.m. to 5:30 p.m., with one instructor; *foundry practice,* a pre-employment course of 350 hours started November 12, 1940, meeting Monday through Friday, 5 p.m. to 12 midnight, with two instructors; *automobile mechanics for American Red Cross ambulance drivers* (women), a supplementary course of 6 weeks started January 8, 1941, meeting Monday, Wednesday, and Friday, from 7 to 10 p.m., with one instructor.

Factory inspection and defense nursing courses are now in the process of organization. Within the next few weeks an assembly course for machine tools and tool parts will be started with two instructors, meeting every weekday, from 8 a.m. to 5 p.m. This will be a 350-hour course.

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THINGS TO THINK ABOUT

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Precepts are but the techniques of desirable social and moral conduct. It is through the practice of these precepts that desirable character traits and social habits are acquired.

Activity is just as essential in establishing character traits as it is in establishing physical skills.

Character traits and attitudes are established through practice not through precepts or preachments. Precepts are expressions of ideals. Character traits are the habits developed as a result of the practice of these ideals. They are acquired rather than learned.

Any school subject providing activity such as shop or laboratory classes has greater potential value in establishing character traits than do those classes which provide only intellectual activity.

Often it is necessary to accompany an idea with a physical experience in order to get the full and true meaning of the words in which it is couched.

Knights of the Day

DEAN M. SCHWEICKHARD*

Knights of Old

In days long gone, great glamour was attached to being a knight. His position was one greatly to be coveted but difficult to attain because of the strength, skill, and bravery required, the rigorous discipline demanded, and the well-nigh impossible feats to be accomplished. He was looked upon as one whose life and works were eminently worth while.

When a youth set out to become a knight he took a stand for the establishment of standards and principles, and the subsequent defense of them. He took a solemn pledge to protect the innocence of childhood, the purity of womanhood, and the infirmity of the aged. These deep-seated values of life were looked upon as sacred, and any violation of the pledge with respect to them, was an act of treason against all humanity.

The shining armor, the plumed helmet, the glistening spear, and the prancing steed were treasured by the knight and admired by the crowd, not as things in themselves, but because they were the material symbols of his accomplishments. No greater disgrace could come to one than to seek the possession of these symbols without earning and deserving them. Thus, the knight came to be revered because of the things for which he stood and the deeds which he performed in the day in which he lived.

The Spirit of the Knight

A serious mistake is made in assuming that the spirit or attitude which prompted the knight of the olden days necessarily died when his trappings fell into disuse. It has existed and can exist in any age, but the form of valor which may indicate its existence varies from one generation to another. No longer is it attended with being knighted by a king, going forth on horseback, and fighting battles with a lance.

A wise principal of an elementary school has discovered an effective means of stimulating such a spirit in her boys and girls. She does not attempt to play the part of a spy or a detective in seeking out offenders or violators of school rules. In fact, she has few rules except those agreed upon among the pupils themselves, by common consent, as the ones essential to the general welfare.

Whenever anything contrary to the accepted regulations occurs in the school or the community, she simply sends out a request through the school for all who were in any way implicated in the affair to come together. No one is asked to tell on anyone else, but to tell his own story plainly and truthfully. He does so with the full knowledge that truthfulness and manliness are the surest ways toward a speedy and satisfactory solution for all.

Similarly, the athlete enters upon his period of training with the full knowledge of the self-discipline required in following the schedule of practice and exercising self-denial. The one who fails to thus discipline himself is the one who falls short of the goals he could otherwise attain. A group of boys wishing to form a club for rifle practice at first saw no relationship between that and any form of organized athletics. They looked upon it as a sport which one engaged in merely for a good time, but an experienced rifleman who spoke to them at their first meeting told them plainly they must develop steady nerves by keeping regular hours, eating plain wholesome food, and refraining from the use of tobacco.

The high school girl who decides she wants to become a nurse does so because she sees in that profession an opportunity to perform a service she considers worth while. Immediately she finds herself subjected to the requirements which must be fulfilled if she is to be ready for the nurse's training course in college. She must take several science courses and other subjects she might not choose if she had only the pleasure of the moment to consider. She moves ahead to her college course fully aware that it will demand much of her in the way of mental, moral, and physical endurance, but she does not waver in her determination because she has the spirit of the knight.

Present-Day Knights

Some might have us believe that in an industrial age such as ours there were no longer a need or a place for a spirit such as the one to which we have referred. This is an industrial age, but we must not forget that the products of industry can either help to strengthen our nation or they can serve to undermine it. The trend and the outcome will depend upon how they are developed and how they are put to use by man himself.

Whether they do the one or the other will be determined largely by the attitudes toward them which are inculcated in the youth which pass through our schools. Youth in great numbers must come to understand that the facilities of industry must be utilized for the production of things people need and can use. They must understand, too, that the service which these products perform in fulfilling human needs must be commensurate with their cost.

The schools of the land have made excellent progress thus far in their preparation to meet this demand. They have acquired the necessary physical equipment as rapidly and completely as financial resources have permitted; their teachers have pressed forward in the enlargement of their professional training; but our entire national stability will be shaken if the schools are weakened by any of the forces which threaten them. Two of the most serious forces which could act upon the schools are decreased public support, either financially or morally, and deterioration or disintegration from within. The second of these is sure to follow any lasting existence of the first.

Our strongest hope lies in the fact that throughout the nation the spirit of faithfulness, valor, and courage is still very much alive and in evidence. Among those who exhibit this spirit are the thousands of teachers faithful to their tasks, and the students moving steadfastly toward their goals. There are the myriads of working people performing their daily tasks faithfully and well; likewise the businessmen and industrialists whose dealings are characterized by fairness and honesty; and in the homes there are the fathers and mothers who believe that example is stronger than precept, and put this belief into practice in the rearing of their children.

We might name many others, but rather let them be known by their deeds. Whoever they be, or wherever they are, or however they serve, they are the ones who shall help to keep us moving onward to brighter goals. The knight of today is the one who wholeheartedly and fervently devotes his ability, his time, and his strength to the preservation of his fellow men and his country, and to the perpetuation of reverence for his God.

*Assistant Superintendent of Schools, Minneapolis, Minn.

STAY ALIVE!

An automobile engine manufactures carbon monoxide gas every time it runs. But this is the season when we begin to bottle it up in deadly doses.

Never warm up a motor in a closed garage. And make sure, too, that there are no leaks in your car's exhaust system. In cold weather, when windows are often closed tightly, the gas can seep through the floor boards and overcome anyone in the car.

You can't see or smell carbon monoxide, but you *can* make sure it will never strike down any member of your family.—*Milwaukee Safetygram.*

The boy who has never worked until the day he goes forth, diploma in hand, to meet the world—generally gets quite a jolt.—*Charles R. Gow.*

Printed Material and the Defense Program

R. RUSSELL MUNN*

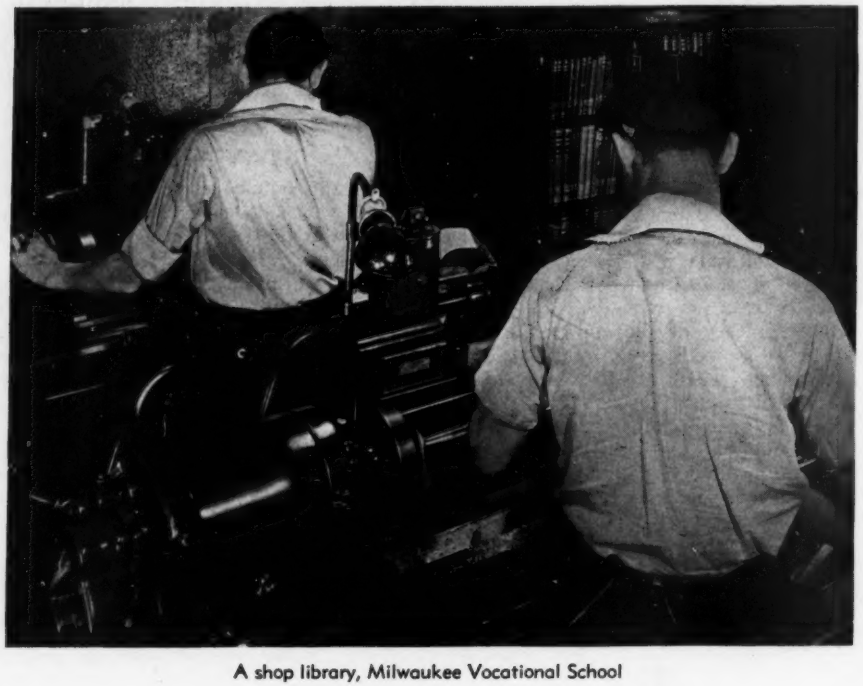
The program of vocational training for national defense which, according to President Roosevelt, now includes over one million men and women, is one of the brightest spots in our whole defense effort. The schools have swung into action in a most efficient way. The trainees, many of whom have been on the unemployed rolls and recognize the program as an unusual opportunity of gaining marketable skills, are keen and industrious. The instructors react with enthusiasm to their genuine interest. It seems clear that, in addition to providing skills necessary for the carrying out of the plans, this program will result in more permanent benefits in increased employability.

Efforts are being made to make the training as efficient as possible. Every effort should be made to make the benefits resulting from the courses of permanent value to the trainees. This article proposes to suggest means to both those ends.

How the Need Was Discovered

As soon as the courses got under way last summer, reports began to come in to the office of the American Library Association, mostly from public libraries, of unusual demands for technical books on the elementary level, demands which were being stimulated by the training program and which far exceeded the ability to meet them. Realizing that the courses were brief and intensive with the stress on learning a specific job, trainees whose ambitions led them beyond that job toward a broader knowledge of the field were coming to the public libraries to obtain the theory for which there was no time in school. School libraries, where they existed, were closed during the summer and later, owing to limited facilities and to the time at which the courses were being given, could do little for the defense trainees. The American Library Association suspected that here were needs, important to national defense, which were not being met by existing agencies. Before definite steps could be taken to call attention to this condition, it seemed advisable to find out, as quickly as possible, the extent to which books and printed materials are used in a well-conducted vocational training program on the secondary school level. Accordingly, a brief study was authorized, financed by Carnegie Corporation funds, which would attempt to collect definite evidence of book use in the regular vocational programs of certain schools of recognized merit in a few of the large cities located east of the Mississippi. Eighteen schools in nine cities were visited by this writer. Many administrators, instructors, and librarians were interviewed and shops and classes observed. The regular courses, for which books were available, were considered in relation to the corresponding "defense" courses for which, in most cases, no book provision was being made.

*American Library Association, Chicago, Ill.



A shop library, Milwaukee Vocational School

The observations made justify the definite conclusion that handbooks, texts, manuals, periodicals, and other printed materials, particularly if they are properly integrated with the shop and classroom activities, are conducive to a more effective training experience resulting in habits which will have permanent effects on the progress of workers after the training period is over. There is ample evidence to show that in vocational education, as much as in any general curriculum, the following statement of the American Youth Commission is valid:

> Free reading in libraries, with some guidance as to good methods of using books, would result in economies and in the cultivation of powers of inestimable value to the individual pupil. The equipment of the best schools of today is being developed in the direction of supplying the facilities for this kind of program. No other contribution to general education can be of importance equal to that which would be gained by making pupils competent readers.[1]

In adapting this statement specifically to vocational education it should be stressed that "free reading" should include the free use of books as sources of definite items of information and data needed to perform certain operations; the curriculum should include instruction in the use of such reference books, as tools of the trade. Furthermore, the reading does not necessarily have to be done in libraries. The best practice indicates that books are most effective if they are available in the place or places where they are most needed, whether this be in the shop, the classroom, the library, or in the student's home. Best results are gained when they are available in all these places.

Systematic Reading a Great Aid

What about the "economies" to be realized from systematic reading in industrial subjects? Experience shows that, by the proper integration of books with the work and class experience, a greater uniformity of teaching may be achieved at the same time that greater attention is being given to individual differences. (1) Access to books will enable the slower student to keep up with the others by putting extra hours into reading at school and at home. It may be contended that this slower student is not likely to be a good reader. But why is he not a good reader? The probability is that his past reading has not appealed to his particular interest. If he is

[1] *What the High Schools Ought to Teach*, American Council on Education, p. 14.

interested in his shop experiences, this may well be the motivation for the correction of a definite reading handicap with corresponding improvement in employability. (2) Books, to the brighter and keener student, are a means of utilizing extra energy by providing scope for a wider and deeper learning experience. Guided reading will allow him to forge ahead and range beyond the average achievement of the group. He will waste less time and learn more. (3) Books and printed materials enable all the students in the class to review previous work at their own speed with a definite saving of the instructor's time. (4) Books assist administrators in maintaining uniform standards throughout a city system, particularly where new or inexperienced instructors are concerned. (5) Most important of all, however, is the economy resulting from the production of a higher grade of product. A shop student who knows how to use books to find specific facts and how to apply them, will be more resourceful and independent as a student and workman, and thereby better able to adjust himself to situations as they appear in industry. This is recognized by the instructors of a certain Detroit school. The following appears at the head of a mimeographed library assignment:

To the pupil:

The object of this unit of metal-fitting work is to teach you (*a*) how to use an index in a book; (*b*) how to order from a catalog; (*c*) to review work previously taught in class; (*d*) to get you acquainted with reference books in auto, machine shop, drafting, and pattern work; (*e*) to teach you how to find information in various subjects, so you can *help yourself* after you leave school.

The idea expressed in the final sentence is, of course, as old as education. In vocational education, however, only the better programs do an adequate job of teaching skills in the use of books as tools. Too often the stress is on developing skills in the use of mechanical tools with the result that printed materials which are perhaps the most important tools of all, providing specific information necessary to the use of all the other tools, tend to be overlooked. Those who do make successful use of books are quite positive as to their value. A shop instructor in a Rochester (N. Y.) school, a man with 17 years experience in industry, waved his *Machinery's Handbook* and spoke emphatically on the values of knowing where to find necessary information. He turned to a section giving gear formulas (the pages had been darkened many shades by repeated use) and insisted that no student could progress beyond the simplest mechanical operation unless he had a full knowledge of where to find such information and apply it to his problems. He was inclined to minimize the value of specially prepared study units and job breakdowns on the ground that such materials will not be available to the worker when he is "on the job." His belief that the important thing is to teach proper habits of book use, with the books that are available and used in industry, sounded like the most practical kind of common sense. The best practice seems to indicate the use of both types of material. The director of training in a large steel plant stated that his apprentice course for machinists, when analyzed as to its primary objective, can be said to be essentially an effort to provide a thorough training in the use of *Machinery's Handbook*. This, of course, is an intensive four-year program. At the other extreme, a regional supervisor of NYA work projects emphasized the value of reading as follows: "The time for related instruction, in the present defense training, is so limited that the job is to direct and encourage trainees in self-study. Obviously books are essential in such a policy." Whether the courses be short or long, the value of printed materials is apparent. It was emphasized repeatedly that the teaching of proper book habits and reading skills should go hand in hand with the development of proper work habits and mechanical skills.

Needed Types of Printed Matter

What kinds of printed materials? The literature now being used in the most effective programs can be divided into several classes.

1. First are the handbooks. Nearly every trade has its compendium of essential information. For the machinist we have *Machinery's Handbook, American Machinist's Handbook,* and Colvin's *American Electrician's Handbook;* the auto mechanic relies on Kuns or on Dyke; and the welder, on the *Welding Handbook* of the American Welding Society. These books give concise information, often in the form of tables and diagrams, on procedures, formulas, standard practices and measurements in their particular trades. They are designed for use by experienced mechanics but are quite intelligible to the student within his range of experience, particularly with guidance and assistance from instructors. These books are reference tools.

2. Texts explain the how and the why of particular instruments, machines, operations and processes. Like texts in any other field they can be made the basis of a vocational course and supplement and explain the handbooks. Many of the best and simplest texts are published by manufacturers, for example: South Bend Lathe Works' *How to Run a Lathe,* Brown & Sharpe Manufacturing Company's *Handbook, a Guide for Young Machinists,* Henry Ford Trade School's *Shop Theory.* The most practical texts on welding are issued by such manufacturers as Lincoln Electric Company, Air Reduction, and Linde Air Products Company. Included also in the category of texts are, of course, the books on mathematics, blueprint reading and drafting. Some instructors like to have their mathematics for a particular trade given along with other information on that trade. Johnson's *Applied Mathematics,* Felker's *Shop Mathematics,* and Timbie's simple texts on electrical essentials are popular for this reason.

Measuring outside tooth angle on a bevel gear with a Universal bevel protractor

3. Operators' manuals or shop manuals are those highly practical publications of manufacturers giving specific instructions on how to operate or maintain particular machines or tools. The leading automobile manufacturers issue useful shop manuals describing the features of their various models and giving approved repair procedures. The useful little *Handbook for Drillers* issued by the Cleveland Twist Drill Company gives many valuable hints on the care and maintenance of drills. These are examples of what is usually obtainable free or at a nominal price.

4. Trade catalogues of the various manufacturers also are widely used in vocational training. In these may be found descriptions of tools or apparatus, showing dimensions and scope, the whole illustrated by cuts, line drawings or cross-sectional views. Even the price information is frequently useful. Many small tool catalogues include handy tables of such information as American Standard threads, decimal equivalents, gear formulas, and the like, which, if used, will take a considerable load of wear from the handbooks. A knowledge of trade names and manufacturers is a further benefit to be derived from using trade catalogues which, even more than operators' manuals, are free for the asking.

5. Magazines and house organs in the various fields are another form of printed matter which receive active use. Although some of them have only an occasional article of value for vocational training they are an excellent source of information about new publications, especially the free and inexpensive material. They aid students and instructors to keep abreast of recent developments and often note new ideas and trends in the trade. The INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine is especially to be recommended to the instructors. The advertisements in all of these periodicals have their value in acquainting students with important manufacturers and contractors in the trades.

6. Other printed materials are the striking charts and other visual aids which may be seen in many shops and classrooms. The many practical government documents might be mentioned here. Films and slides might also be called printed materials. Certainly, along with others mentioned, they are important means of instruction.

7. Finally, to complete the picture, mention must be made of the excellent study units and course outlines prepared by the schools themselves. Many of these are well illustrated, clearly and simply written and frequently revised. Since they are prepared for use in a particular school system and not usually available to other schools or to students when courses are completed, they do not come into the scope of this article. Some of them are of such excellence that it is hard to understand why they have not appeared in printed form.

The Problem of Getting the Right Material

In comparing the printed materials used for training, as just described, with those required by the more academic courses, one important difference will be noted: the books used in the academic subjects are largely available from regular commercial publishers, while a considerable proportion of those most useful in industrial training are not. Operators' manuals, pamphlets, trade catalogs, charts, and many excellent texts are published by manufacturers who expect to receive a return, not from the sale of the books, but rather from increased use or efficiency of operation of their regular products. Consequently, the selection and collection of vocational materials is a more complicated problem, involving all the elements of ordinary book selection plus a knowledge of the tools and materials used in the shops, the kinds of trade publications which are likely to be usable, where and how to obtain them. The work requires eternal vigilance, imagination, and sufficient time to check all likely sources.

In a school, where many courses are given, this selection is carried on most efficiently if it is centralized in a single administrative unit. Sound administration requires a trained librarian who is actually a *co-ordinator of materials*. He and his staff keep in close touch with instructors and students, discovering their book needs, making every effort to seek out the most suitable materials and to assist in integrating them with the students' experiences.

The selection and collection of materials is, of course, only part of the function of a well-managed library. Other functions are distribution and guidance in use of the available reading and illustrative material. As co-ordinator of materials, the librarian's responsibility is to see that the books at his command are available wherever they can be most efficiently used. Certainly they are needed in the shops for reference while questions are *hot*. Certainly they are needed in the classroom where drafting, mathematics, and other related theory is being taught. They are also needed in the school library where the student has access to a basic collection of reference tools and books on many subjects. A major objective of the school library is to create a *library habit* which will carry over, in terms of a greater use of public libraries, after the student has left school. Moreover, the school library itself is organized for the purpose of lending books for home use. It can be easily demonstrated that if the right kind of technical books are available for loan, they will be borrowed and used, particularly by mature students. Limited loan periods arouse the desire in ambitious students to own their own technical books. Librarians as well as instructors are fully aware of the virtues of book ownership and will encourage and assist in choosing and securing books needed by individuals. School librarians maintain close contact with the public library and borrow, for faculty or students, any unusual material needed. At least three of the schools visited had definite arrangements whereby students were introduced to the public library and its facilities.

Comparing automobile brakes. Pontiac car. Chrysler Maintenance Manual

The Function of the School Librarian

The school librarian has an important function as co-ordinator of printed materials in a vocational school or in a high school with shop courses. In cooperation with instructors, he sees that an adequate quantity of the best available books are accessible where they are most needed. Where this co-ordinating function is lacking, where there is complete decentralization in the acquisition and use of books, there is a danger that some instructors may overlook important titles, or fail to use others to their fullest efficiency. A general lack of system in lending for home use results when there is no integration with the school library. The most successful programs are those in which the administration of the books is centralized and where, to a certain extent, their distribution and use is decentralized.

If it be granted that training for the mechanical trades on the secondary school level will profit from a well-integrated book service, it might be assumed that the same is true of the industrial defense courses now being sponsored by the United States Office of Education. Unfortunately it is not possible to demonstrate this from actual practice because nowhere had provision been made for adequate book service to these classes. With few exceptions the books provided for the regular day pupils were not available to the defense classes which usually meet at night. Even the books in the shops were, in most cases, carefully locked up. The only evidence of the need is to be found in the complaints of educators themselves and, even more revealing, the reports of unprecedented demands on public libraries from trainees in defense classes.

Opportunities for using books in the preemployment refresher courses are, of course, limited. These are for unemployed men with previous work experience; they are short and intensive, designed to prepare men for specific jobs. Little provision is made for related theory, and books, likewise, receive scant attention. The whole objective here is to get men placed quickly, with emphasis on the personnel needs of industry. Provision for educational experiences of special value to the men, experiences which will help them to gain a wider and more thorough technical knowledge and extend their skills beyond that required by the immediate job, is presumably made in the "supplementary" defense courses. The *refresher* courses help them to get a job, the *supplementary* courses help them to qualify for a better one. The latter are for men already employed in defense industries who are willing to devote some of their spare time to training. If books are necessary in regular vocational classes, surely they are necessary here, where mature men, strongly motivated by domestic responsibilities, are working on special problems which have confronted them on the actual job. But they are not being provided here either. According to the official interpretations of the appropriating act, cost of courses may not include cost of books and other instructional material "unless it can be shown that such material is necessary as a part of the instruction for a specific course." Permission is thus granted in a restricted sense leaving it up to each administrator to plead his case before his state board for vocational education. So far there is little evidence of success in this direction.

The Library Service and the Defense Trainees

There are definite obstacles in the way of a satisfactory and economical book service directly to defense trainees. Since the time for related theory is limited, the greatest need is for reference books in the shops and loan service to the men. This would hardly warrant the presence of a librarian or a library through which books could be administered if they were provided. Perhaps several schools in a community might share a librarian who would collect books necessary to the defense training program and make them available for loan to the men in each school at a certain specified time each week. An interesting experiment is under way in one large city, where the public library is attempting to meet the need by sending trained librarians to the schools with suitable books at times when it is convenient for the men to borrow them. This may well be one solution to the problem; perhaps the public library, which is the only source of free book service to the adult worker, is best fitted to serve his training needs. However, public library resources being what they are, a satisfactory job will not be done without supplementary financial assistance.

Industrial training in the regular school program needs library services for more economical teaching and for achieving a greater carry-over of good book habits into the actual job. In some outstanding vocational schools this printed material and library service are provided. In many more schools, however, little or no provision is made.

The mature workers, who are being trained for national defense, need books for the same reason, yet for them there is even less provision. These trainees, in most cases, do not have access to those school libraries which do exist and many public libraries are unable to cope with the unprecedented demands directly traceable to the stimulation of defense courses. It is clear that many of the men themselves realize the need, and not getting this service, they are disappointed. It seems obvious that a *bottleneck* exists here which calls for some immediate and decisive action.

Graphic Aids in Continuous Occupational Analysis

CLYDE A. BOWMAN*

(*Concluded from April, 1941, issue of* INDUSTRIAL ARTS AND VOCATIONAL EDUCATION)

In the two preceding articles on the uses of graphic aids in continuous occupational analysis, emphasis has been placed upon the four types of relationships commonly found in occupations; namely, organization, travel or flow, content, and index. In this, the concluding article, sample graphic aids are suggested based on these relationships illustrating the use of the graphs in the identification of significant material in several additional occupational fields.

In the expansion of the content and its applications to increase the contributions of industrial arts in the social adjustment of the individual, the general shop has developed rapidly. In the junior high school, the comprehensive general shop of the general-mechanics type has had a rapid growth. In the senior high school, and to some extent in the larger junior high schools, the general metal shop, general woodwork, general electrical, general graphic arts, or general drawing and general printing and the like have increased. One of the developments in the senior high school has been the work under the general heading of general industrial mechanics. This work has included the mechanical cores in large divisions of our social-industrial civilization. Besides developing the individuals as intelligent consumers, the work also has served to give the students an increased breadth of basic mechanical intelligence and insight, as a foundation on which to

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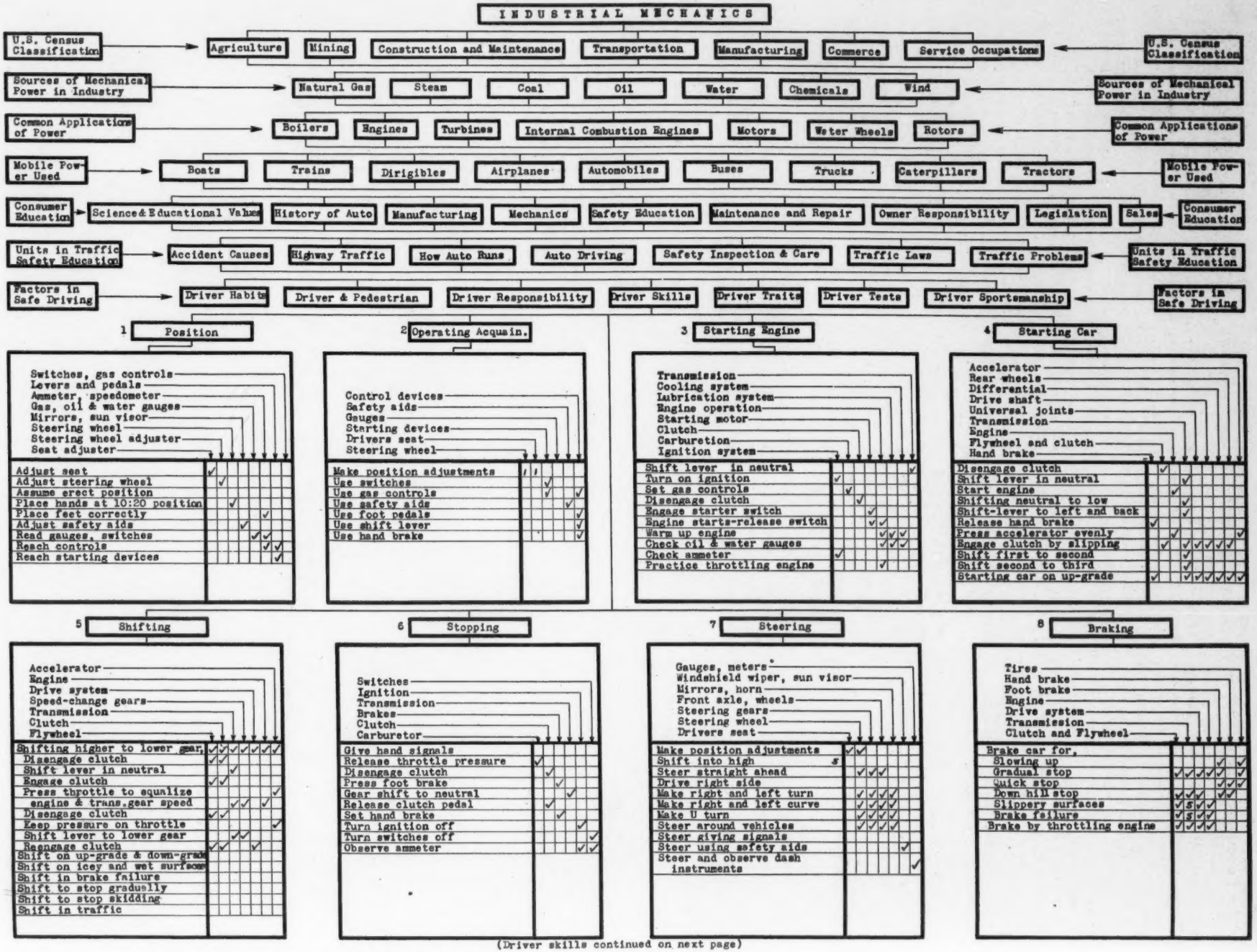

(Driver skills continued on next page)

Fig. 13. Courtesy William Jumer, Edwin Denby High School, Detroit, Mich., and H. F. Good, The Stout Institute, Menomonie, Wis. This chart continued on following page

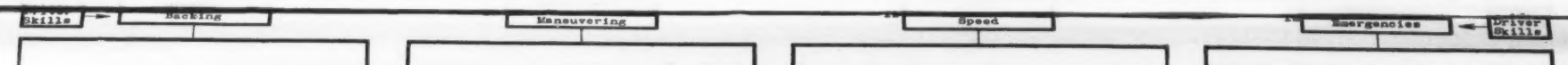

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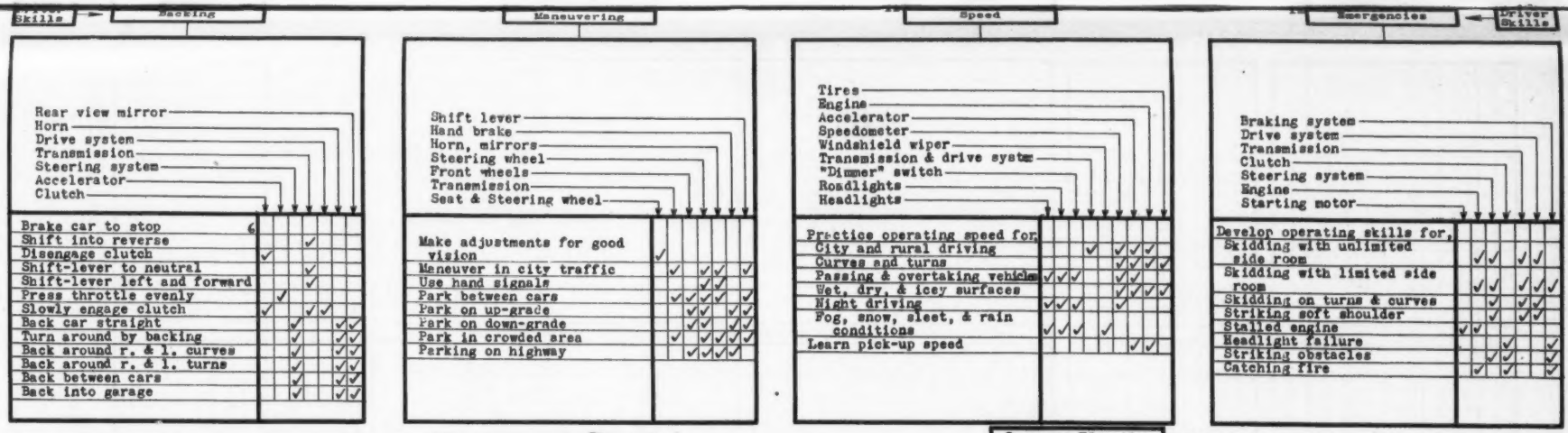
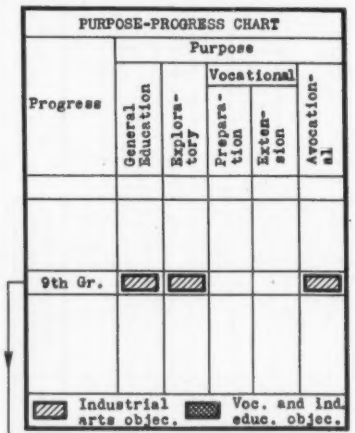
Fig. 13. Courtesy William Jumer, Edwin Denby High School, Detroit, Mich., and H. F. Good, The Stout Institute, Menomonie, Wis. This chart continued on following page





PURPOSE OBJECTIVES OF COURSE

The course in industrial mechanics, of which automobile-safety education is a unit, will be taught in the ninth grade.

The objectives of the automobile-safety education course are:

To gain a knowledge and respect for the rules of traffic conduct.

To gain an understanding of accident factors and circumstances.

To develop a proper sense of responsibility and a real safety consciousness.

To develop a background of information regarding the safety equipment and upkeep of an automobile.

To teach the elements and techniques of safe driving.

To give an understanding of function, operation, and maintenance of the elements of the automobile.

To develop a consumer knowledge of values in automobiles

Consumer Education

TEACHING UNITS	Shop	Laboratory	Academic	RELATED TECHNICAL INFORMATION	Illustrative Material	Related Social Sciences
1. Familiarity with correct position		x	x	Low windshield, fenders, & hood-road vis.	Pictures, photographs	
2. Manipulation of levers, controls, appliances		x	x	Functions of gauges, safety aids, devices, and controls	Diagrams, models, pictures	
3. Engine starting operations	x	x	x	Operation, upkeep of engine, and accessory systems	Films, models, drawings, pictures	
4. Procedure in starting car	x	x	x	Transmission of power engine to wheels	Diagrams, films, models, sketches	
5. How and when to shift	x	x	x	Functions and up-keep of drive system	Models, pictures, diagrams	
6. Method of stopping	x	x	x	Reaction time; Stopping distances	Graphs, charts, diagrams	
7. Correct steering practice	x		x	Purpose and up-keep of steering system	Pictures, sketches, films	
8. When and how to use brakes	x		x	Operation, inspection, & adjust't of brake	Diagrams, charts, models	
9. Shifting operations & practice in backing	x	x	x	Speed, position, safety aids in reversing	Pictures, sketches	
10. How to maneuver and park	x		x	Judgment of distance and space	Films, photographs	
11. Proper speed under varied conditions	x		x	Effect on car operating costs	Graphs, charts, films	
12. Skillful driving in emergencies			x	Mech. equipment to meet emergencies	Films, sketches, pictures	

Fig. 13. The conclusion of the chart shown on opposite page

Fig. 14. Courtesy Arthur Maronek, School of Vocational and Adult Education, Watertown, Wis. This chart continued on next page

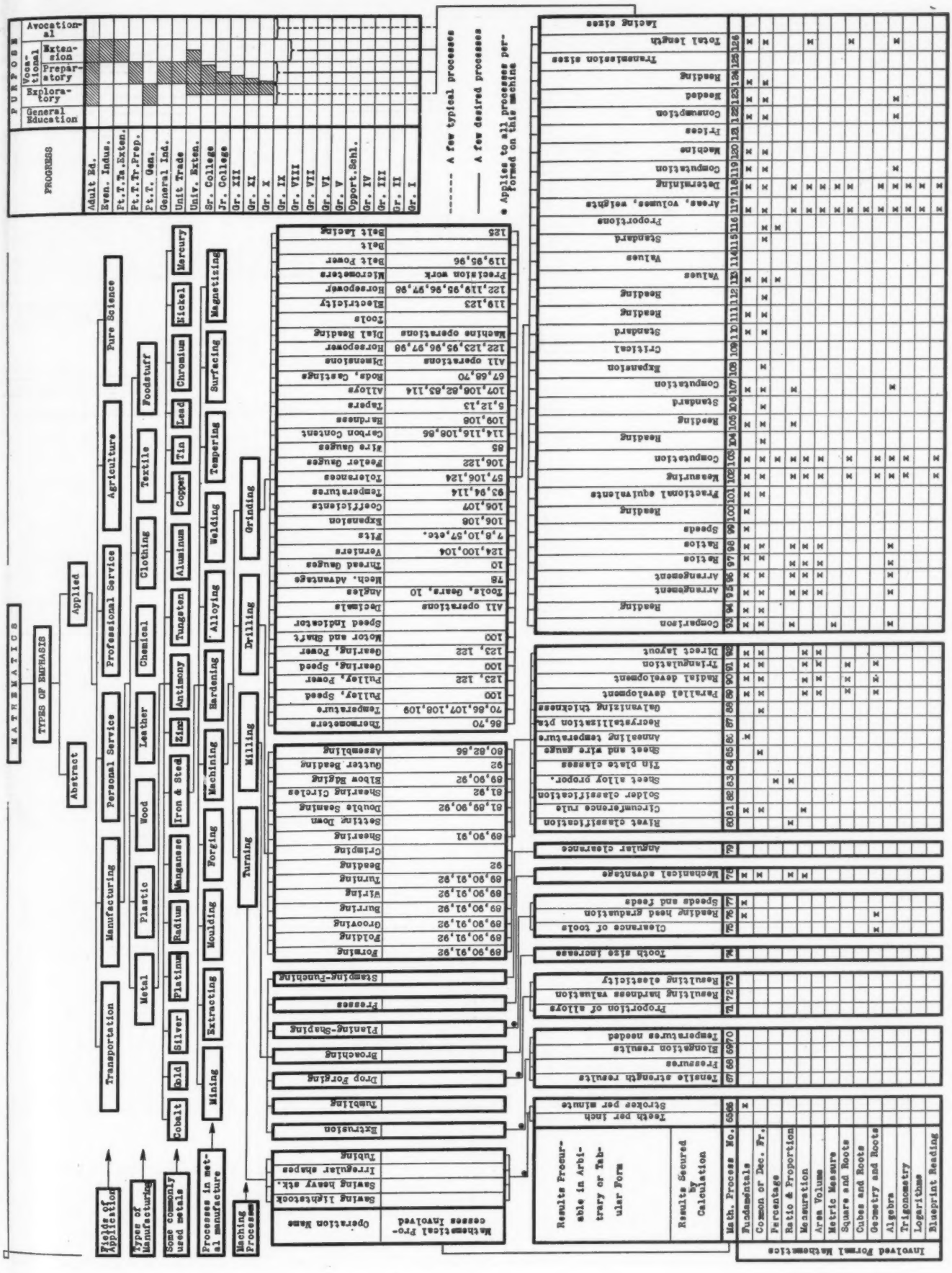


Fig. 14. Courtesy Arthur Maronek, School of Vocational and Adult Education, Watertown, Wis. Continued from previous page

Fig. 14. Courtesy Arthur Maronek, School of Vocational and Adult Education, Watertown, Wis. This chart continued on next page

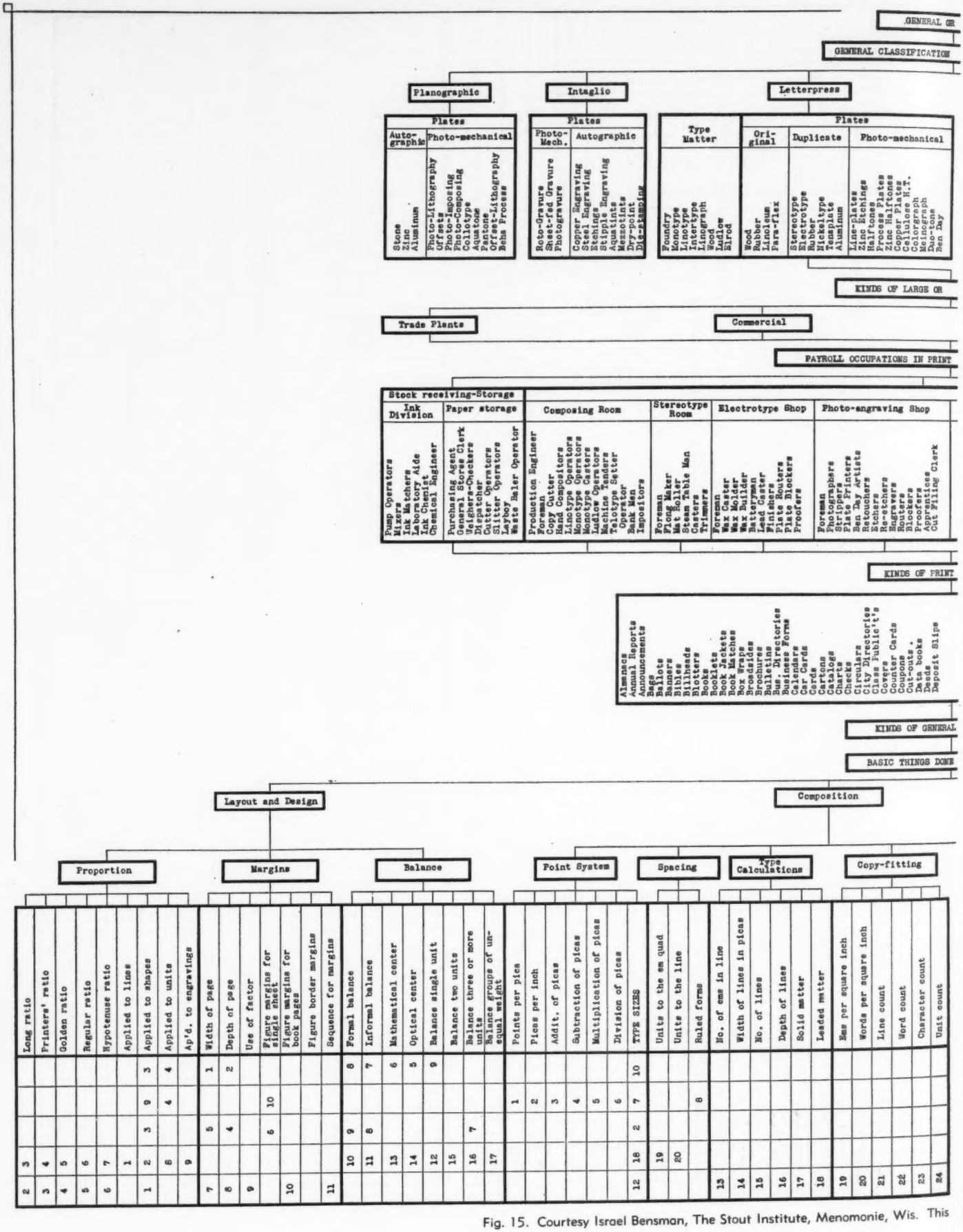
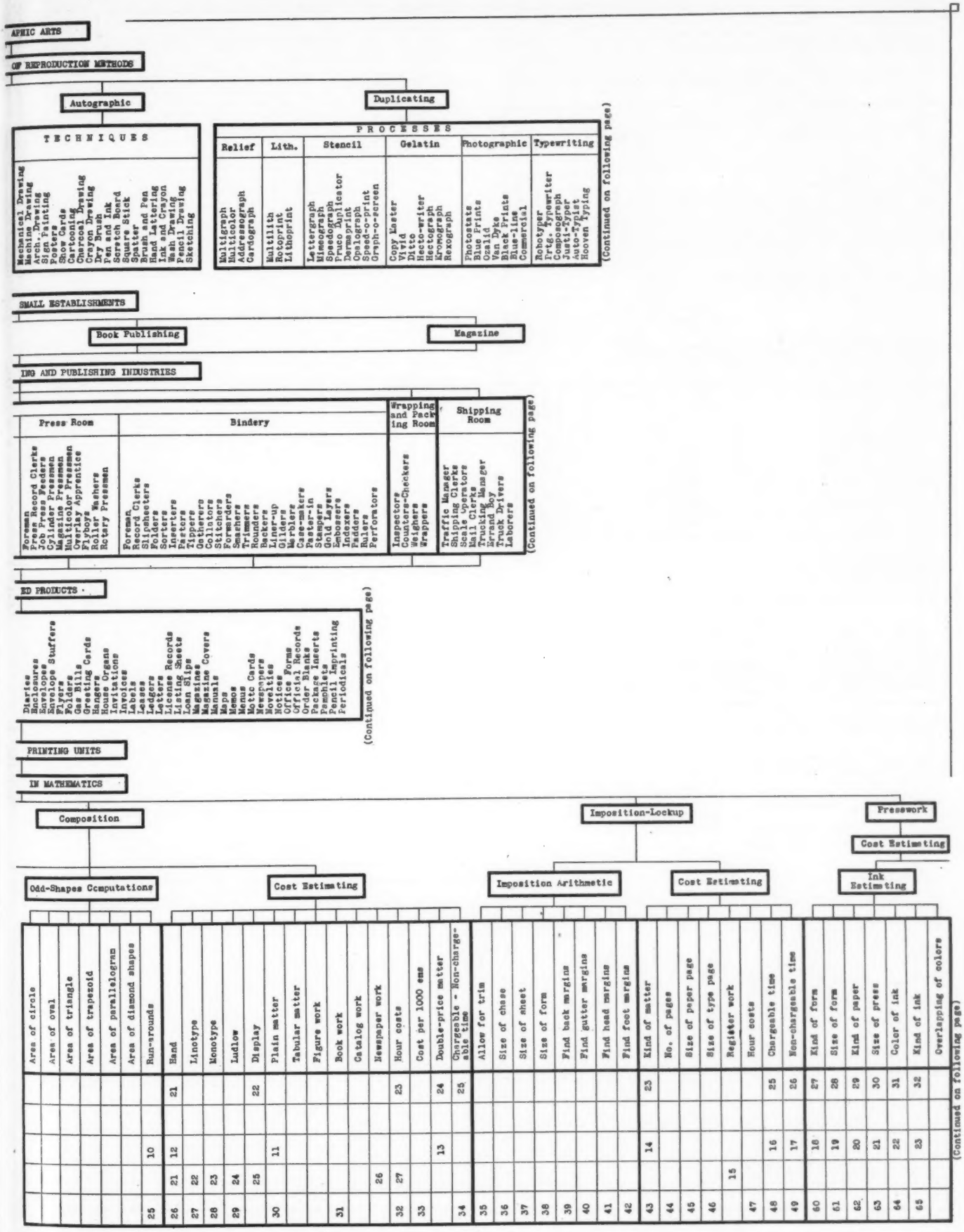


Fig. 15. Courtesy Israel Bensman, The Stout Institute, Menomonie, Wis. This



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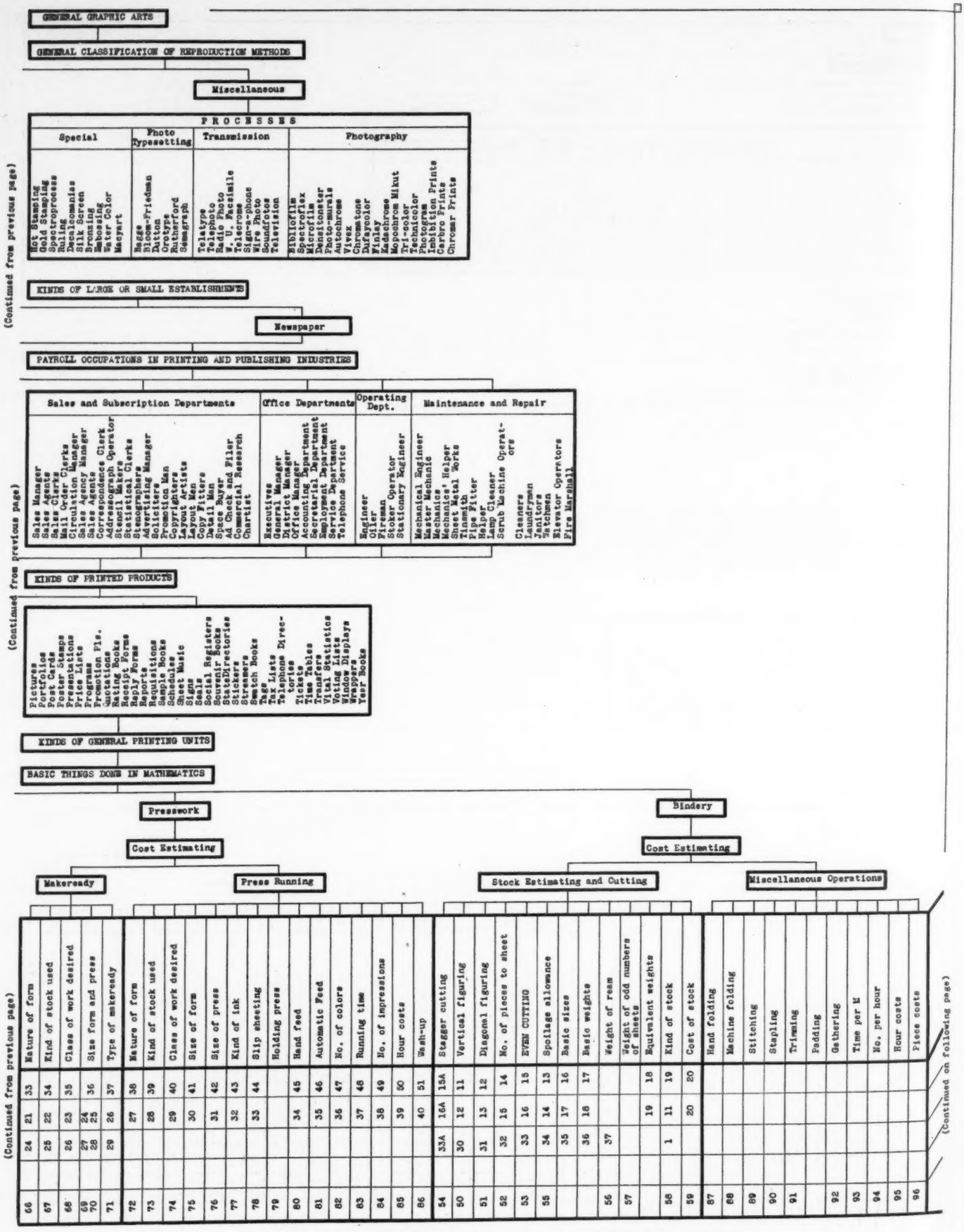

Fig. 15. This chart is continued from previous page, and concluded on the next page

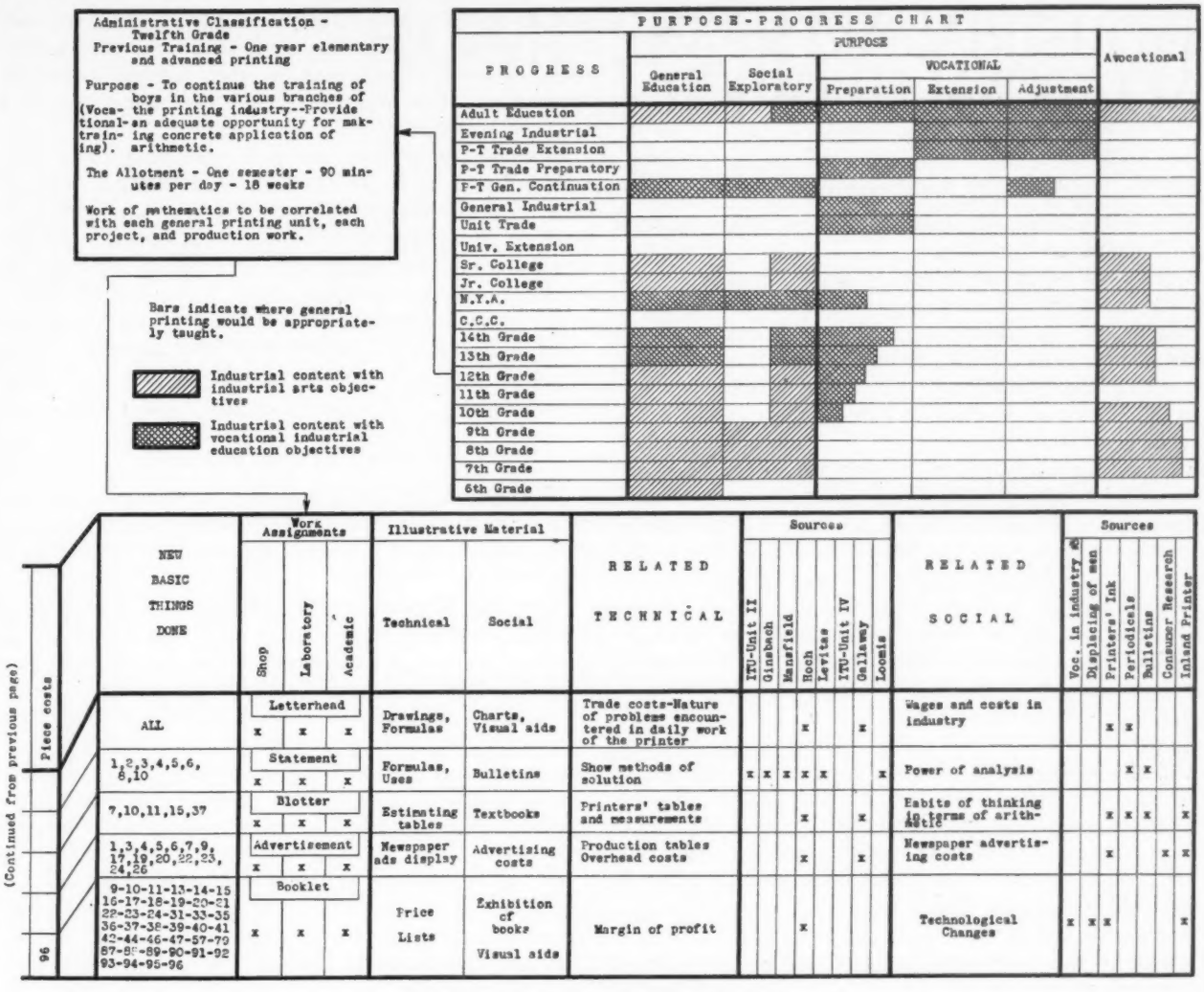

Fig. 15. This is the conclusion of this chart

build later vocational training and specialization. The purpose of the work is still within the general education territory, but serves to aid the individuals as they are about to enter vocational preparation. Figure 13 is a suggestive content graph to help in identifying classifications and content in general-education auto mechanics, as a possible phase or section in industrial mechanics.

Figures 14 and 15 are two suggestions in the graphic recording of identified, related material. Figure 14 is the graphic analysis of the content in related mathematics in machine-shop work. The path of approach is indicated by reading from the top of the chart down. The content indicated is that which is related to machine work in iron and steel. Such a content chart is made more effective by the addition of the indexing at the bottom. Figure 15 is a content chart in general graphic arts suggesting the several classifications which may be used in orienting related mathematics in this field. Use is made of the index relationships at the bottom of the chart and also at the right in classifications of purpose-progress student groupings.

As the teacher gains familiarity with the organization, travel or flow, content and index relationships in the occupational areas which he represents, the graphs which at first may seem rather complicated will become easy to understand and very helpful in keeping a continuous record of those happenings which result in changes in his source areas of instructional material. By having the graphs available for incidental reference by pupils, the charts will serve as aids in habituating the students to change in an interesting and accurate manner.

Industrial Arts Laboratory, Chicago Public Schools, Dr. Louis Newkirk, director, Bureau of Industrial Arts

INDUSTRIAL ARTS and VOCATIONAL EDUCATION
John J. Metz, Editor

A Great Achievement

Last month marked the fiftieth anniversary of the birth of artificial abrasives. Like so many epoch-making discoveries, it was the result of an idea backed by intelligent experimentation. The inventor, Edward Goodrich Acheson, was trying to produce a form of crystalline carbon which would possess diamondlike hardness. He knew that carbon had something to do with producing hardness in steel, also that the diamond, consisting as it does of carbon in its crystalline form, was an extremely hard substance.

To try out his theory, he took an iron, plumbers melting pot and attached it to a lead from a dynamo. Then he placed a mixture of clay and coke into the pot. Into this mixture he inserted an arc-light carbon, which he had connected to the other pole of the dynamo. After the current had been passed through the mixture for some time, the center portion melted under the terrific heat generated by the electric arc. Then he allowed the mass to cool, and eagerly examined it. The results, however, seemed far from satisfactory and he was about to throw away the remaining cinderlike substance, when he spied a few bright specks. Placing a piece of this new material on the end of a lead pencil, he started to experiment with it. He found that it would cut glass readily. Then he placed some particles on an iron disk in a lathe and found that it would even cut a diamond. He had succeeded in producing the new, extremely hard, chemical compound which we now know as silicon carbide. Acheson himself named it Carborundum, and under this name it is still manufactured and sold.

Because of the extreme hardness of this new abrasive, it was at once adopted by the gem polishers for rough cutting diamonds and precious stones. At this time it was sold at 40 cents a carat, which is equivalent to $880 a pound. Improvements in electric furnaces soon brought down this price, and then other experiments were made with bonding materials so that the abrasive soon supplanted the older emery tool-grinding wheels. Its success in this field quickly expanded its usefulness in industry until today one can truthfully ascribe much of the progress made in producing mechanical and electrical devices to the abrasive discovered by Dr. Acheson.

His invention has placed the grinding wheel in the foremost ranks of the cutting tools. With it, precision work, obtainable only by laborious and time-consuming methods by expert mechanics on the power tools of 50 years ago, can now be accomplished on the modern grinders in the space of seconds. In this way Acheson's discovery has helped greatly in making interchangeable manufacturing methods a possibility. For this reason, too, it deserves much credit for the enormous growth of the automobile industry, and for making possible such undertakings as those proposed in the way of airplane production under our present National Defense Program.

It is men like Dr. Acheson who help to stimulate the industrial progress for which our country is noted. Quietly and unheralded they work in sheds, basements, home shops, factories, and laboratories to produce the wonders of modern industry, science, and invention. Many of them are hardly known outside of their own fields of activity. Every one of them, however, in some way or other, has had to acquire a background upon which to build the foundation of his accomplishment.

It is the school shop, the science laboratory, and the instructors who are teaching in these classes that frequently furnish the inspiration which result later on in these far-reaching improvements. It is for this reason that industrial arts and vocational education is becoming increasingly more recognized as an important factor in the education of our youth for an industrial civilization such as the one in which we now live. While this fact may be pleasing to the shop instructor, he must not forget that it also imposes real responsibilities which he must recognize and assume.

What of the Future?

With graduation day practically within sight, it may be well for the student who is just finishing high school to look ahead and see what is in store for him as far as employment is concerned.

With the National Defense Program in full swing and gaining momentum from day to day, the lot of the 1941 graduate seems to be much better than that of the graduates of the past several years.

There are still many peculiarities about the labor market, however. A study recently made by the Milwaukee office of the state-federal public employment office was instigated by the fact that in spite of the increased employment opportunities, there were still over 37,000 registered as unemployed job seekers.

Of those registered, 27,066 were men. An analysis of these applicants shows that 6005 or 22.1 per cent are listed as unskilled laborers. The next largest group consists of 4786 or 17.6 per cent semiskilled laborers. Then there are 4408 or 16.2 per cent who belong to the construction and building trades. Out of the 2600 or 9.6 per cent that are listed as skilled workers, only 178 belong to the metal-trades group. Then there are 2844 or 10.5 per cent inexperienced workers under 25 years of age; 1316 or 4.8 per cent are listed under professional and technical classifications; 2917 or 10.7 per cent are commercial workers; 548 or 2 per cent are agricultural hands; and 1642 or 6 per cent are classified under various other classifications.

Information such as this is valuable in helping students get the right view of what the future offers. Those who are content to fit themselves for nothing better than unskilled or semiskilled labor must be prepared to compete against a large contingent always present in any labor group. As is evident from the foregoing, these two classifications embrace 10,791 or almost 40 per cent of those who are still looking for jobs.

Attention should also be called to the fact that the majority of those given training under the National Defense Training Program cannot qualify later on as skilled tradesmen. They may become good machine hands, but unless they take advantage of courses offered in the schools to advance themselves, they will never become all-round mechanics.

Youth of today may find it easier to get employment than was possible for the graduates of the past 10 or 11 years, but they still need guidance, and the instructors of industrial arts and vocational education, above all, must not overlook this.

HOME SPORTS

JAMES HEATH*

An Industrial-Arts Play

In many junior high schools each teacher has an opportunity to arrange and carry through a school assembly program based on the subject which he teaches. For the industrial-arts teacher this is a challenge to his ability in arranging an original program which will emphasize the importance of his subject.

When arranging an assembly program, I searched many books, without success, for a short play which would show the application of industrial arts in the home, so I made an attempt to write a play which would fit well into our program.

This play was so successful in the school assembly that we were asked to repeat it at parent-teacher meetings where it met with similar success. Many of the parents and school officials realized for the first time what was being taught in the school shops. That their interest in industrial arts was aroused was manifested by the many personal visits which they paid to the shop.

The play is based on a boy who applied his shop training to make much-needed repairs in his home. The play is given a humorous background in the many incidents that arise to disturb the peace and quiet of this typical American family. Mother is driven to despair by her husband's unwillingness to make any repairs about the home, little suspecting that Father's principle "Every man to his own trade" is merely a cover up for his inability to do that type of work. Sister shows a catty skepticism of her brother's ability to make the repairs that become more and more necessary as the play progresses.

The stage is set for a scene in a workingman's home. The time is after the evening meal. Father is reading the newspaper. Mother is busy with her household duties. Sister Alice is helping mother with the ironing. Repeated noises are heard from backstage as brother Tom works in the cellar.

FATHER: Well, Mother, it feels good to be able to sit down and enjoy reading the paper in peace after a hard day's work in the warehouse.

MOTHER: Yes, Father, but when you finish reading your paper and feel rested, I wish you would fix a few things for me. [*She holds out a pair of scissors with which she has been cutting some cloth.*] These large scissors need tightening and the job will take only a few minutes.

FATHER: Now, don't bother me with jobs tonight. I'll fix them *all* for you later when I have a little spare time.

MOTHER: Oh yes, I know you will. That's what you always say, but I never see you do it. Spare time indeed — your paper takes all *your* spare time.

FATHER: Can't I even enjoy a few minutes rest. I work all day. Do I have to work all night too?

MOTHER: It's useless to argue, just useless. [*Father groans.*] [*Tom makes a hammering noise in the cellar.*]

FATHER [*Slamming down his paper*]: Now what's all that racket about? Can't we have some peace and quiet here?

MOTHER: It's Tom, downstairs. Ever since he started industrial arts in school, he has been spending a lot of his time working with tools down in the cellar. He cleaned up the cellar and made a bench to work on — why he even found some old picture frames in the attic and used the glass to repair the broken cellar windows *you* promised to fix a long time ago. At least he doesn't take after his father.

FATHER: Do you call making a racket like that doing a job? I bet he doesn't learn much in school that will help him when he grows up. I never did believe in all those fool things like drawing, woodwork, home mechanics, and printing. It's only a waste of time. [*Calling out loudly*]: Tom, come up here!

[*Tom enters dressed in overalls. He has some tools suspended from his belt.*]

FATHER: I wish you would stop wasting your time downstairs and do some studying instead. You make too much noise anyway.

TOM [*Holding out a doll carriage in his hand*]: But, Dad, I want to finish this doll carriage for the little girl next door, and I promised to give it to her tomorrow.

FATHER: What are you going to do — go into the toy business?

ALICE: Of course, you wouldn't think of mending any toys for your sister.

[*During this conversation Alice has been ironing. Suddenly the lights go out leaving the stage in darkness.*]

FATHER [*Above the noise made by rest of family*]: Now what's the matter with those darn lights? Light a candle someone. I suppose we'll have to do without electric lights for the rest of the evening. [*Mother lights a candle.*] I'll call up the electric-light man to fix them tomorrow.

TOM: I know what's wrong, Dad. The fuse has blown out, but I know how to fix it. Give me the light, and it will only take me a minute. I have a new fuse ready, as the teacher said we should have, for just such an emergency like this.

ALICE: There goes the magician, now just watch him fix it.

MOTHER [*To Father*]: There now, he doesn't take after you.

[*Tom goes out, and the lights go on. Tom enters again.*]

FATHER: Where did you learn about blown fuses, Tom?

TOM: The shop teacher gave us a lesson on fuses, and —

ALICE: Oh, Mother, the iron is cold. Something is wrong with it.

TOM: Let's have a look at that cord, Sis. Oh, oh — the connection on the cord got loose and that's what caused the fuse to blow out. I'll fix it in no time if you will stop crowding me.

[*Tom works on the end of the ironing cord, fixing it.*]

ALICE: Smart as usual, why don't you give up?

TOM: Try it now, Sis. It should be all right now.

ALICE [*Tries the iron*]: It *is* getting warm. Now I can finish my ironing.

[*The doorbell rings.*]

FATHER [*Starts and explains*]: Say, Mother, what happened to the doorbell? I haven't heard it ring for the last six months.

[*Alice goes out to answer the doorbell.*]

TOM: I fixed it, Dad. Our teacher showed us how to fix bells, n'everything.

*Alfred E. Burr Junior High School, Hartford, Conn.

MOTHER: Tom cleaned out the drain trap so you don't have to call in the plumber for that job.

FATHER: We'll have to call him in anyway to fix the leaky faucet in the sink. [*Smiling.*] Or perhaps you know how to fix that too, Tom.

TOM: That's easy, Dad. All it needs is a good 3-cent washer. Perhaps I could interest you in letting me go to a 25-cent show if I fix it?

FATHER: All right, I suppose it would cost more than 28 cents to bring in the plumber.

ALICE [*Comes in with some pans*]: Mrs. Jones left these pans and wants to know if Tom will solder the holes in them the way he did your pans, Mother.

TOM: Sure I will. Our teacher wants us to bring in a lot of pans to the shop to be soldered.

FATHER: Say, son, in what kind of a shop do you learn to fix all these things?

TOM: That's in the home-mechanics shop where we learn to do all kinds of jobs and in the woodwork shop. Say, Dad, I forgot to show you this smoking stand I made for grandpa. You know his birthday is next Saturday. [*Holds out smoking stand, which he has just brought in.*] Now "ain't" that something?

FATHER [*Examining smoking stand*]: Son, that sure is a dandy. I wonder if I could visit your school shops and have a talk with the shop teacher.

TOM: Come on down, Dad. The teacher likes to have people come in and see what we are doing. And say, Dad, you know our teacher has an evening school for men like you who want to learn how to do all the jobs that he says every man should be able to do around his own home.

FATHER: Well, you tell your teacher that I'll be over to see him next week. I wish I had known about that sooner.

MOTHER: And *so do I.*

[*Curtain*]

Testing and Tests

TEST IN ART-METAL WORK

A. L. Thiede,
State Teachers College,
Mankato, Minn.

Following is a group of false and true statements. If the statement is true make a circle around the *T* along the left margin. If the statement is false make a circle around the *F*.

1. F T To anneal metal means to make the metal hard.
2. F T Silver and copper while red hot may be plunged into water or the "pickle" solution without damage.
3. F T A pickle solution, consisting of a small portion of acid in water, is used for cleaning some metals.
4. F T Copper has the characteristic of ductility.
5. F T Brass is an alloy consisting of copper and tin.
6. F T Brass while very hot should not be plunged into water.
7. F T Pure silver is very soft, therefore, it is unsatisfactory for objects demanding wearing qualities.
8. F T Sterling silver is an alloy of silver and nickel.
9. F T Pure gold is too soft for all ordinary purposes so it is alloyed with other metals to make it serviceable.
10. F T There is one gauge system in use in this country for specifying the thickness of metals.
11. F T A number O jewelers saw blade is finer than a number 2 saw blade.
12. F T Sawing of art metals is done with a coping saw.
13. F T Saw blades are put into the saw frame with the teeth pointing toward the handle.
14. F T On small work, a needle file of the best suited shape is used to true up the edges.
15. F T It is necessary to bring the work to a red-hot heat in hard soldering.
16. F T The flux used for soldering silver is rosin.
17. F T In hard soldering the work should be heated slowly to permit oxides to form.
18. F T Chasing is a method of surface decoration.
19. F T Piercing is a term used to describe an operation done with the chasing tools and hammer.
20. F T Chasing tools should stretch the metal, not cut it.
21. F T Planishing is done with the buffer.
22. F T A copper rivet is measured by the diameter of the stem and the length from the underside of the the head to the end.
23. F T An escutcheon pin can be used in place of a small rivet.
24. F T Liver of sulphur is used as an abrasive in polishing copper.
25. F T One should keep the saw moving up and down while turning corners on a piece of art-metal work.
26. F T Champleve is a type of enameling.
27. F T The word *karat* is used as a means of stating the proportion of gold in an alloy.
28. F T One of the metals in pewter is tin.
29. F T Pewter is obtained from pewter ore.
30. F T A good flux for one metal will work equally well on all metals.
31. F T One advantage of aluminum over other metals is its indifference to atmospheric conditions.
32. F T A chief use of antimony is in forming alloys.
33. F T Small twist drills are specified by gauge number or by the diameter in fractions of an inch.
34. F T Number 12 wire is larger than number 9 wire.
35. F T Hand snips are used for cutting 14- and 16-gauge metals.
36. F T Copper ore when taken from the mine often contains other metals such as gold, silver, arsenic, lead, etc.
37. F T Copper ore is obtained by underground mining and also by open-pit mining.
38. F T It is impossible to draw aluminum into wire.
39. F T Liver of sulphur is used to color or oxidize copper and silver.

Key to False and True Statements

1. F	15. T	29. F
2. T	16. F	30. F
3. T	17. F	31. T
4. T	18. T	32. T
5. F	19. F	33. T
6. T	20. T	34. F
7. T	21. F	35. F
8. F	22. T	36. T
9. T	23. T	37. T
10. F	24. F	38. F
11. T	25. T	39. T
12. F	26. T	40. T
13. T	27. T	
14. T	28. T	

40. F T Monel metal consists chiefly of copper and nickel.

Following is a group of incomplete statements. Read each sentence and fill in the word or words which will complete the statement.

1. A ..... and pliers can be used for reducing the size of wire used in art-metal work.
2. When raising a bowl, frequent ..... is necessary to prevent the metal from becoming too hard.
3. The thickness of sheet metals is measured with a small instrument called a .....
4. The metal which forms a large proportion of the alloy brass is .....
5. After being ground to a powder, enamel must be ..... several times before it is placed into the cells.
6. The metal alloyed with silver to make the more durable sterling silver is ....
7. 24-ounce copper means that there are 24 ounces in a .....
8. The usual soft solder, also called 50-50 solder, is made of ..... and .....
9. Hammering makes copper ..... while heating to a red heat followed by .... in the air or in water softens it.
10. Brass is an alloy of ..... and .....
11. The machine used extensively in mills and shops for cutting sheets of metal is the .....
12. Pewter solder is an alloy of ..... and .....
13. *Cut* acid or *killed* acid used frequently as a flux is made by putting pieces of ..... in ..... acid.
14. The wire the next size smaller to number 9 wire is number .....

15. It is difficult to solder large pieces of copper because copper is an exceptionally good ..... of .....
16. The property of metal which permits the metal to be drawn out is called. .....
17. The property of metal which permits the metal to be rolled into thin sheets or to raise them into curved forms is called .....
18. Bronze is an alloy of ..... and .....
19. If one hears the words, bastard, second cut, smooth, or supersmooth, it has reference to the cut of .....
20. The smaller the gauge number the .... the metal.
21. The tool used to finish off the end of a rivet to make it appear similar to the head is called a .....
22. In metalwork *sweating* is a form of .....

Key for Completion Group

2. annealing	13. zinc, muriatic, or hydrochloric
1. draw plate	14. 10
3. gauge	15. conductor, heat
4. copper	16. ductility
5. washed	17. malleability
6. copper	18. copper, tin
7. square foot	19. files
8. lead, tin	20. thicker
9. hard, cooling	21. rivet set
10. copper, zinc	22. soldering
11. squaring shears	
12. tin, lead	

Following is a group of incomplete statements. Place the number of the word or phrase which completes the statement in the parentheses.

1. For a flux in soldering silver we use (1) borax, (2) cut acid, (3) rosin, (4) soldering paste ( ).
2. Piercing is done with (1) chasing tools, (2) jewelers saw, (3) engraving tools, (4) small chisels ( ).
3. A piece of 24-ounce copper would be about the same thickness as Brown and Sharpe (1) 10 gauge, (2) 16 gauge, (3) 20 gauge, (4) 24 gauge ( ).
4. Copper may be etched with a solution of water and (1) Sulphuric acid, (2) Muriatic acid, (3) Nitric acid, (4) Acetic acid ( ).
5. Which one of the following is the name of a standard gauge system: (1) Kueffel and Esser, (2) Brown and Sharpe, (3) Starrett, (4) McGraw Hill ( ).
6. Silver solder will roll into a ball because (1) it is too hot, (2) the joint to be soldered fits too tight, (3) the project is underheated, (4) the project is overheated, (5) too much flux has been applied ( ).
7. Hard soldering differs from soft soldering in that (1) the work has to be brought to a red-hot heat, (2) no flux need be used, (3) the solder does not have the same appearance as the metal, (4) the solder has the same appearance as the metal ( ).
8. For fine careful work one should use saw blade (1) numer 0, (2) number 3, (3) number 5, (4) number 7 ( ).
9. Sterling silver is an alloy of silver and (1) nickel, (2) zinc, (3) copper, (4) antimony, (5) tin ( ).
10. If one used the words, flat, square, half round, round, mill, it has reference to (1) wire, (2) metals, (3) dowels, (4) rivets, (5) files ( ).

Key for Multiple Choice Group

1. 1	3. 3	5. 2	7. 1	9. 3
2. 2	4. 3	6. 3	8. 1	10. 5

KEY TO PRINTING TEST

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This is a key to the tests on printing published on page 285 in the September, 1940, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

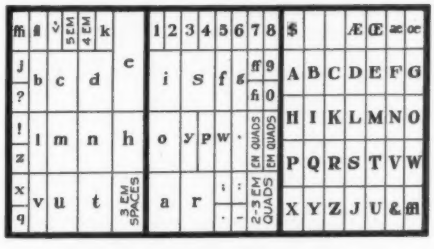
Unit I — Principles of Typesetting

Part I — Multiple Choice Test

1. (c)	12. (b)	23. (d)
2. (a)(d)(e)(f)	13. (c)	24. (b)
3. (a)	14. (d)	25. (d)(f)(g)
4. (c)	15. (a)	26. (a)
5. (e)	16. (b)	27. (b)
6. (e)	17. (d)	28. (d)
7. (d)	18. (b)	29. (b)
8. (d)	19. (c)	30. (d)
9. (b)	20. (a)	31. (c)
10. (b)	21. (e)	32. (b)
11. (e)	22. (b)	33. (c)

Part II — Completion Test

1. Apprentice	10. Family
2. Linotype	11. Body and display
3. Monotype	12. Point
4. Type high	13. Picas
5. Hardness	14. Nonpareil, Pica, Inch, Foot
6. Toughness	
7. Font	15. Upper, Lower
8. Job fonts	16. California Job
9. Nick	17. Capitals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? i m n h
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x v u t 3 EM SPACES a r 2-3 EM QUADS
q
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A B C D E F G
H I K L M N O
P Q R S T V W
X Y Z J U & ffl

No. 19, Part 2

Part III — Matching Test

Type sizes:

a) 2	*e*) 7	*i*) 9
b) 1	*f*) 8	*j*) 10
c) 3	*g*) 6	*k*) 11
d) 5	*h*) 12	*l*) 14

Parts of a composing stick:

a) 3 *b*) 1 *c*) 4 *d*) 2

Procedure Test

Holding the stick:

a) (d)	*d*) (a)	*g*) (e)
b) (f)	*e*) (c)	
c) (g)	*f*) (b)	

INDUSTRIAL-ARTS AERONAUTICS TEST, NO. 2

M. D. Caffin,
Scotch Plains Township High School,
Scotch Plains, N. J.

Directions: Place the identifying letter of the correct answer in the parentheses at the right.

1. The type of oil most widely used in the internal combustion engine for lubrication purposes ( ).
   (A) mineral oil
   (B) vegetable oil
   (C) whale oil
2. Oil with a low pour point is ( ).
   (A) oil at a low level in the crankcase
   (B) oil that produces cracked gasoline
   (C) oil that flows at low temperatures
   (D) oil that does not pour readily
3. Carbon residue is formed in an internal combustion engine, by ( ).
   (A) carbon content of the oil
   (B) the portion of the oil that does not burn
   (C) a paraffin base oil
4. An internal combustion engine is ( ).
   (A) one in which fuel is burned within the engine cylinders
   (B) an engine that is covered by a hood or cowling
   (C) a steam engine
   (D) an engine that has intake and exhaust valves
5. A unit of heat energy is referred to as ( ).
   (A) an erg
   (B) a B.T.U.
   (C) a horsepower
   (D) a candlepower
6. Practically all airplanes employ the ( ) lubricating system.
   (A) splash
   (B) oil pump
   (C) pressure
   (D) crankcase
7. The liquid fuel that will stand the greatest amount of compression is ( ).
   (A) benzol
   (B) gasoline
   (C) Ethyl alcohol
8. The "Otto" Cycle is ( ).
   (A) another name for the Diesel cycle
   (B) one that requires spark ignition
   (C) another name for the four-stroke cycle
   (D) a two-stroke cycle.
9. A stroke referring to an engine is ( ).
   (A) a complete cycle
   (B) a 360-deg. turn of the crankshaft
   (C) movement of the piston from one extreme to another in the cylinder
   (D) a movement of the connecting rod
10. Vapor lock results from ( ).
    (A) oil that vaporizes in the crankcase
    (B) premature vaporization of gasoline in the carburetor
    (C) use of gasoline of low volatility
    (D) failure of the gasoline to vaporize at the proper time
11. Maximum operating power for aircraft engines may be obtained from a fuel mixture consisting of ( ).
    (A) 11 parts air, one part gasoline
    (B) 18 parts air, one part gasoline by volume
    (C) 13.3 part air to one part gasoline by weight
    (D) 16.2 parts air to one part gasoline by volume
12. The chief advantage of the pressure fuel system in an airplane engine is ( ).
    (A) fuel lines will not clog
    (B) permits flow of fuel in any position of flight
    (C) fuel is fed to the carburetor with greater pressure
13. A crankshaft whose pins are offset 3 in. would give an engine a stroke of ( ).
    (A) 7 in. (C) 6 in.
    (B) 8 in. (D) 9 in.
14. Assuming that there is a power stroke every 120 deg. of crankshaft turn in a six-cylinder engine, there would be ( ).
    (A) a power lapse of 60 deg.
    (B) power overlap of 60 deg.
    (C) neither lapse nor overlap of power
    (D) a valve overlap of 20 deg.
15. The function of the carburetor float chamber is ( ).

(A) to remove impurities from the fuel by floatation
(B) to mix the fuel and air in the proper proportions
(C) to provide a constant flow of fuel to the metering system

16. The amount of fuel metered by the carburetor and mixed with air is controlled by ( ).
(A) size of the float chamber
(B) type of fuel used and its density
(C) the venturi tube
(D) the size of the main jet opening

17. A supercharger is a mechanical device used in airplane engines in order to ( ).
(A) charge the battery at a faster rate
(B) supply more current to the ignition system
(C) priming the fuel lines prior to starting
(D) supplying the engine with a greater weight and volume of fuel mixture especially at high altitudes

18. A larger supercharger impeller (in diameter) is preferable to a smaller one because ( ).
(A) it produces more air pressure
(B) it can travel at a lower r.p.m. and still produce the necessary pressure
(C) it provides more fuel economy in operation at high speeds

19. The term ignition applied to an internal combustion engine means ( ).
(A) the system of electric wiring used to furnish current
(B) the process of burning a fuel mixture in the combustion chamber of the cylinder
(C) the "timing" of an engine so that the valves open in proper sequence

20. A six-cylinder engine with a bore of 5 in. and a stroke of 8 in. has a *total* piston displacement of ( ).
(A) 117.81 cu. in.
(B) 942.48 cu. in.
(C) 1042.64 cu. in.
(D) 40 cu. in.

Key for Part 1

1. A	8. C	15. C
2. C	9. C	16. D
3. B	10. B	17. D
4. A	11. C	18. B
5. B	12. B	19. B
6. C	13. C	20. B
7. C	14. C	

Key for Part 2

1. B	6. Q	11. D
2. M	7. J	12. E
3. O	8. A	13. F
4. P	9. R	14. G
5. N	10. C	15. H
		16. S

Part 3

Directions: In the indicated space you are to supply the missing word or words to complete the statement correctly.

1. Two types of engine cylinders (shapes) used in internal combustion engines are ..... and .....
2. Two types of valves commonly used in airplane engines are ..... and .....valves.
3. The function of the plate cam in ..... a radial engine is to .....
4. Three types of engine lubricants (classified as to source) are:
1. ..... 2. .....
3. .....
5. The function of the rocker arms in a radial engine is to .....
6. Two products of oil distillation are ..... and .....
7. All oils tend to ..... in viscosity when heated and to ..... in viscosity when chilled.
8. Free sulphur may be detected in oil by immersing a piece of ..... in it for several hours.
9. The top or closed part of the piston is commonly known as the .....
10. Pistons in modern aircraft engines are made of .....
11. The function of the connecting rods is to .....
12. Two systems of lubrication used in internal combustion engines are:
1. ..... 2. .....
13. External combustion engines generally use ..... types of fuels, but internal combustion engines commonly use ..... types of fuels.
14. The piston is connected to the connecting rod by means of .....
15. Depending upon the type of engine, a connecting rod may be of the ..... type, the ..... type, or the ..... type.
16. The various phases of the four-stroke cycle in successive order are:
1. ..... 2. .....
3. ..... 4. .....
17. A four-stroke cycle engine produces a power impulse every ..... degrees of crankshaft turn, whereas the two-stroke cycle produces a power impulse every ..... degrees of crankshaft turn.
18. The function of a wobble pump in the fuel line is to .....
19. An airplane engine may be operated on a mixture ranging from ..... parts air to one part gasoline (rich mixture), to ..... part air to one part gasoline (lean mixture).
20. A four-cylinder engine of 90 h.p. would be likely to employ a ..... type of fuel system.
21. The function of the carburetor is to .....
22. In general, the more volatile the fuel that is used, the ..... the size of the intake manifold for most efficient operation.
23. The carburetor is connected at one end to the ..... and at the other end to .....
24. Most airplane engines today use a ..... to furnish the electrical energy necessary for the operation of the ignition system.
25. Ignition in the Diesel cycle is produced by ..... whereas in the Otto cycle, it is produced by .....
26. A six-throw twelve-cylinder engine has ..... connecting rods on each crankpin.
27. Three types of engine bearings used in airplane engines are:
1. ..... 2. .....
3. .....
28. The aircraft engine crankcase is usually made of ....., the reason for this being .....
29. The intake manifold carries the ..... from the ..... to the cylinders.
30. If the firing order for a six-cylinder vertical engine is 1, 5, 3, 6, 2, 4, the firing order from left to right bank of a twelve-cylinder V engine would be:
Left bank, ...
Right bank, ...
31. The function of the induction coil is .....
32. One horsepower of work is done when ..... lb. are raised ..... in one minute.
33. The efficiency of an engine with an indicated horsepower of 100 and a brake horsepower as shown on a dynamometer, of 80 h.p., is .....
34. Four different types of airplane engines in use today are:
1. ..... 2. .....
3. ..... 4. .....
35. The plate cam is located in the ..... section of the radial engine, whereas the cylinder foundations and the main crankshaft bearings are located in the ..... section.

Key for Part 3

1. I head and L head.
2. Mushroom, tulip.
3. Actuate the push rods (which in turn actuate the rocker arms).
4. Mineral, vegetable, animal.
5. Actuate the valves.
6. Gasoline, naphtha, benzene.
7. Decrease, increase.
8. Copper.
9. Head.

Part 2

Directions: Find the statement in the right-hand column that matches each statement in the left-hand column most closely. In the parentheses place the identifying letter.

1. ( ) 2-stroke cycle
2. ( ) Uses fuel injector
3. ( ) Lean gas mixture
4. ( ) 180 deg. crankshaft
5. ( ) 360 deg. crankshaft
6. ( ) Lead tetraethyl
7. ( ) Camshaft
8. ( ) Cam lobes
9. ( ) Greater supply of fuel mixture to engine cylinders
10. ( ) Tallow
11. ( ) Castor oil
12. ( ) Paraffin-base petroleum
13. ( ) Pour point
14. ( ) Viscosity
15. ( ) Straight run gasoline
16. ( ) Cracked gasoline

A. Plate cam
B. Clark cycle
C. Animal oil
D. Vegetable oil
E. Mineral oil
F. Cold test
G. Saybolt test
H. Fractional distillation
I. Otto cycle
J. Actuates the valves
K. Higher compression ratio
L. 6-cylinder engine
M. Diesel cycle
N. Radial engine
O. Detonation
P. 4-cylinder engine
Q. Permits greater compression with no pinging
R. Engine supercharger
S. Destructive distillation

10. Aluminum.
11. Transmit power from piston to crankshaft.
12. Splash, pressure.
13. Solid, liquid.
14. Piston pin (wrist pin).
15. Plain, articulated, split.
16. Intake, compression, combustion, or power exhaust.
17. 720, 360.
18. Prime, fuel lines for starting.
19. 11, 18.
20. Gravity.
21. Vaporize the fuel and mix it with proper amount of air.
22. Smaller.
23. Fuel supply, intake manifold.
24. Magneto.
25. Electric spark, heat of compression.
26. 2.
27. Plain, roller, ball.
28. Aluminum, lightness.
29. Fuel mixture, carburetor.
30. Left bank, 1, 5, 3, 6, 2, 4; Right bank, 6, 2, 4, 1, 5, 3.
31. Increase the voltage.
32. 33,000, 1 ft.
33. 80.
34. Radial, V, opposed, in line, X, W.
35. Nose, main.

Part 4

Directions: Place a circle around the correct answer to denote whether the statement is correct (yes), or incorrect (no).

1. About 75 per cent of the heat energy developed by an airplane engine is converted into useful work ..... Yes No
2. The greatest loss of heat energy in airplane engines is through friction and radiation Yes No
3. Petroleum products such as gasoline and Diesel oil are called hydrocarbons because they produce heat through the burning of hydrogen and carbon which they both contain Yes No
4. An engine running on a rich mixture produces less carbon than running on a lean mixture Yes No
5. Asphalt and paraffin base are classifications of vegetable oil Yes No
6. Asphalt-base oil contains very little sulphur and is dark and heavy with a disagreeable odor Yes No
7. Most paraffin-base oil is at present obtained from Pennsylvania, West Virginia, and New York, whereas asphalt and semiasphalt-base crudes predominate in midcontinent and Mexican fields ..... Yes No
8. Free or uncombined sulphur is desirable in a good grade of engine oil ..... Yes No
9. Paraffin-base oils have a lower drop in viscosity than asphalt-base oils when heated, and therefore are better for use in airplane engines ..... Yes No
10. An oil of low viscosity is desirable in an engine that develops a high temperature ..... Yes No
11. Oil with a low flash and fire point will cause excessive oil consumption, whereas too high a flash and fire point may result in the fouling of spark plugs, and cause excessive carbon residue ..... Yes No
12. Oil after being used in an engine for a certain length of time "wears out" and has no further use ..... Yes No
13. Gasoline can be compressed to a higher degree than benzol and therefore is better for use in the internal combustion engine ..... Yes No
14. A highly volatile gas is one that has a high rate of evaporation when exposed to the air ..... Yes No
15. The gravity-feed fuel system uses a fuel injector ..... Yes No
16. A double-barrel carburetor is really 2 carburetors in one, since it has 2 main jet systems ..... Yes No
17. Compression ratio is the amount a gas can be compressed before burning spontaneously ..... Yes No
18. Locking keys are used to insure shut off ignition ..... Yes No
19. The exhaust-valve spring is usually lighter than the intake-valve spring so that it may be opened more readily ..... Yes No
20. Without the use of a supercharger, an airplane engine flying at high altitudes will lose power ..... Yes No
21. The make-and-break ignition system is the same essentially as the jump spark system ... Yes No
22. The function of the condenser in the ignition system is to draw the current from the points when they open, and thus collapse the magnetism in the primary coil ..... Yes No
23. In a radial engine, the push rods are in direct contact with the valves ..... Yes No
24. The purpose of piston rings is to reduce oil consumption .. Yes No
25. Radial engines use the plain type of connecting rod ..... Yes No
26. A poppet valve is one that makes a popping noise in opening and closing, and is therefore not used in airplane engines ..... Yes No
27. Most radial engines have an odd number of cylinders because it would be impossible to fire every other cylinder successively, and yet have the firing impulses evenly spaced around the crankshaft with an even number of cylinders .... Yes No
28. A radial engine may be divided into three sections: nose section, mounting section, and supercharger section ..... Yes No
29. The magneto incorporates in one unit the mechanism for generating current, and stepping up the voltage ..... Yes No

Key for Part 4

1. no	11. yes	21. no
2. no	12. no	22. yes
3. yes	13. no	23. no
4. no	14. yes	24. no
5. no	15. no	25. no
6. no	16. yes	26. no
7. yes	17. no	27. yes
8. no	18. no	28. no
9. yes	19. no	29. yes
10. no	20. yes	

NOTE: In the aeronautics test published in the January, 1941, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, by this same author, several questions concern student solo licenses. This correction applies especially to Part 3, question 6. The Civil Aeronautics Authority has canceled future issuance of student solo licenses, effective as of May, 1940. Those previously issued, however, remain enforced until May, 1941, after which they cannot be renewed. Under present regulations a student may fly solo after eight hours of dual instruction, and after passing a physical examination. He must receive a signed certificate from his instructor attesting to his experience and ability to fly solo.

TESTS FOR THE PRINT SHOP

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Chisholm, Minn.

Part I — Test on Related Information History of Printing

The following consists of a series of incomplete statements. In the blanks, provided for that purpose, insert the word or words that will complete the thought.

(Example: Question 1 is correctly answered.)

1. A continent that once existed between Africa and Australia is now called *Lemuria.*
2. Piles of stones raised to commemorate some event in prehistoric days were called .....
3. The early Egyptians perfected a system of writing called .....
4. The Chaldeans perfected a system of recording on clay tablets. They used ..... letters.
5. A tall reed from which early paper was made is called .....
6. The Chinese had been making paper long before the Europeans. They made it from (1) ....., (2) ....., (3) ....., (4) .....
7. To modern civilization, the Phoenicians' greatest contribution was the .....
8. Vellum is made from the skins of .....
9. Parchment is made from the skins of .....
10. A long strip of papyrus, vellum, or parchment, rolled up on two sticks, on which records were kept during the Middle Ages was called a .....
11. The man who is credited with the invention of the printing press was named .....
12. Printing was introduced into England by .....
13. The first country in America to have a printing press was .....
14. The first printer in Pennsylvania was .....
15. The greatest of all early American printers was the colonial statesman .....

Part II — Test on Related Information Requirements and Compensation

1. Printing ranks ..... among the industries of the United States.
2. Most of the printers in the United States are ..... born.
3. To be a printer a boy must be ..... handed.
4. A printer's eyesight must be good. He cannot therefore be .....
5. A printer must have an ..... sense in order to succeed.
6. Most print shops follow the ..... regulations in regard to wages, etc.

7. All branches of the printing industry are thoroughly .....
8. According to the Cleveland survey, the percentage earning good wages in printing is higher than is any other industry except in .....
9. One half as many employees in automobile factories earn ..... or more per week as in the printing industry.
10. One eighth as many employees earn $25 a week or more in the ..... and ..... as do in the print shops.

Part III — Test for Printing
The System of Measure

The following are a series of statements that can be finished by writing the proper word into the space provided for it.

1. The printer's system of measure is called the .....
2. In 1 in. there are ..... points.
3. In 1 in. there are ..... picas.
4. In 1 in. there are ..... nonpareils.
5. 6 points are equal to one .....
6. 2 nonpareils equal one .....
7. This system of measure was developed by a French engraver named .....
8. In 5 in. there are ..... picas.
9. How many leads are there in a slug? .....
10. A form was set 30 picas long and 18 picas wide. It is to have a 3-pica margin all around it. What is the paper size in in.? .....

Problems and Projects

RAPID DETERMINATION OF LUMBER AND SHEET-METAL COSTS

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High School,
Lake City, Mich.

The device illustrated in Figure 1 consists of a piece of ¼ by 27 by 40-in. veneer, painted white, over which were painted the green, black, and red stripes and figures. The cost table at the top was prepared on thin paper and shellacked onto the painted surface. The guide strips at the bottom and the right were of material 1-in. square stained a dark color and attached to the veneer base with ¾-in. screws put through from the back. The entire devise received two coats of clear varnish and was secured to the wall of the shop at a height convenient for the shop boys to use.

The cut of lumber or metal to be measured, which cut is usually rectangular in shape, is placed snugly in the lower right-hand corner against the guide strips and flat against the board. The position of the one exposed corner of the piece of material to be measured is noted with relation to the curved lines on the measuring device. Following the nearest curved line downward to the table at the left, the scale or measure may be readily estimated to tenths of a board foot or of a square foot. Following the same line to the cost table at the top, the total cost of the piece will be found in the vertical column corresponding to the line followed, at a point intersected by the row horizontal to the price per square foot. The prices per square foot are between the paired lines in the cost tables as shown in Figures 1 and 2.

In Figure 1 a board to be measured is shown in position on the measuring device. The corner at A is nearest a curved line which when followed downward and to the left shows the piece of material to contain approxi-

(Continued on page 209)

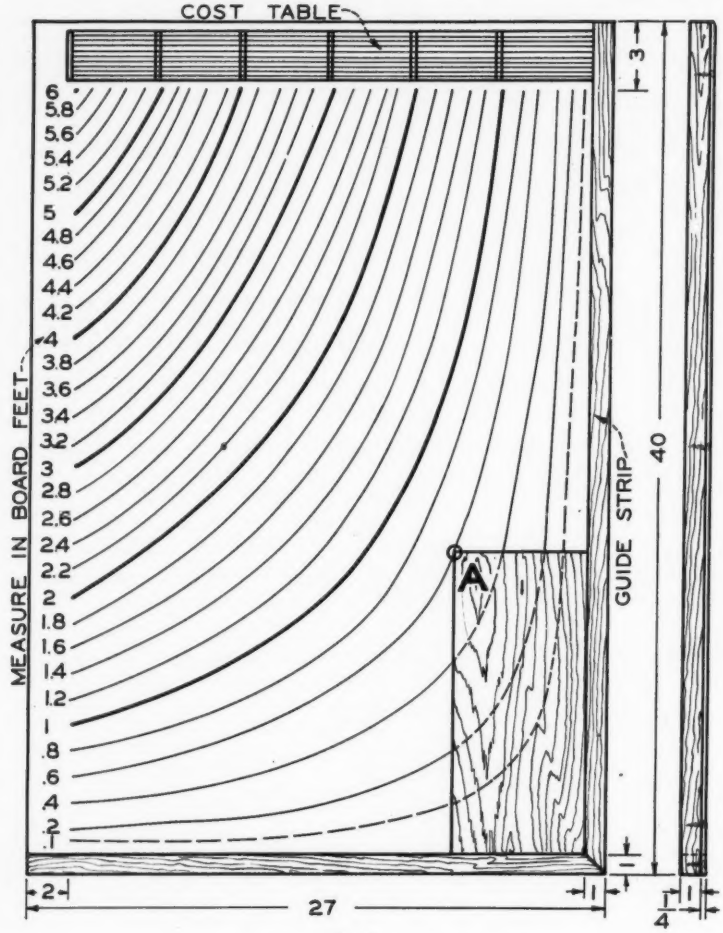


Fig. 1.

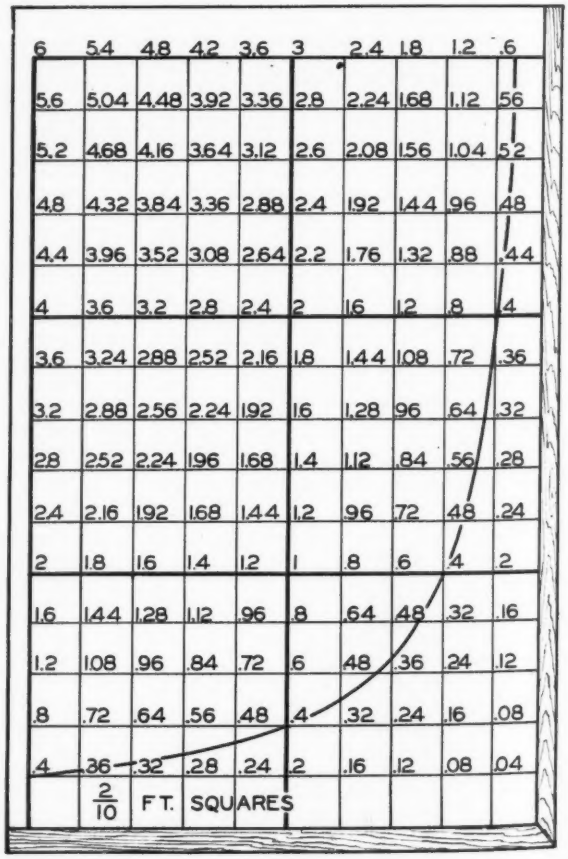
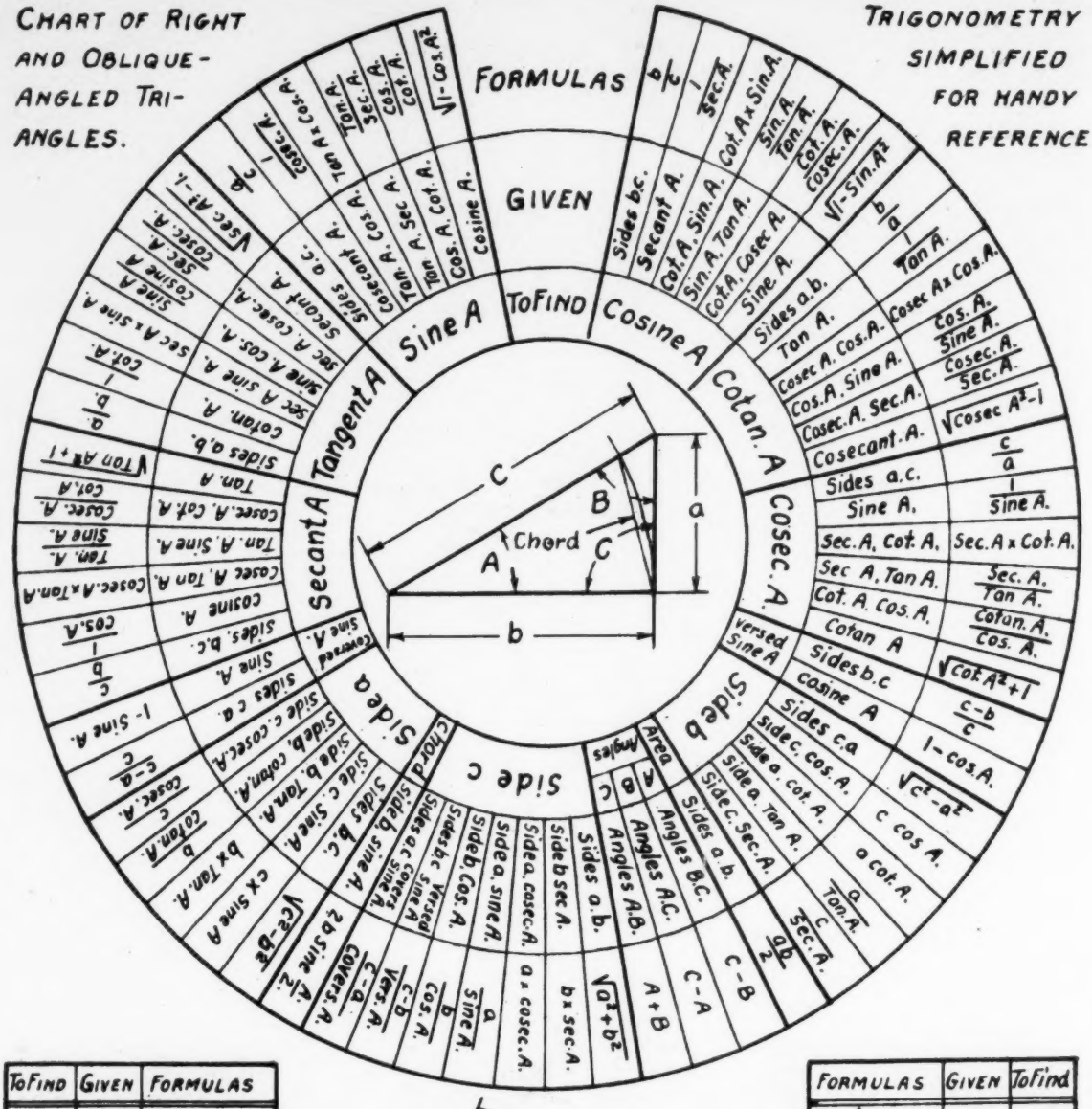


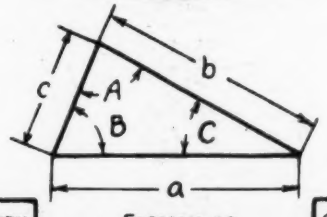
Fig. 3

CHART OF RIGHT AND OBLIQUE-ANGLED TRIANGLES.

TRIGONOMETRY SIMPLIFIED FOR HANDY REFERENCE



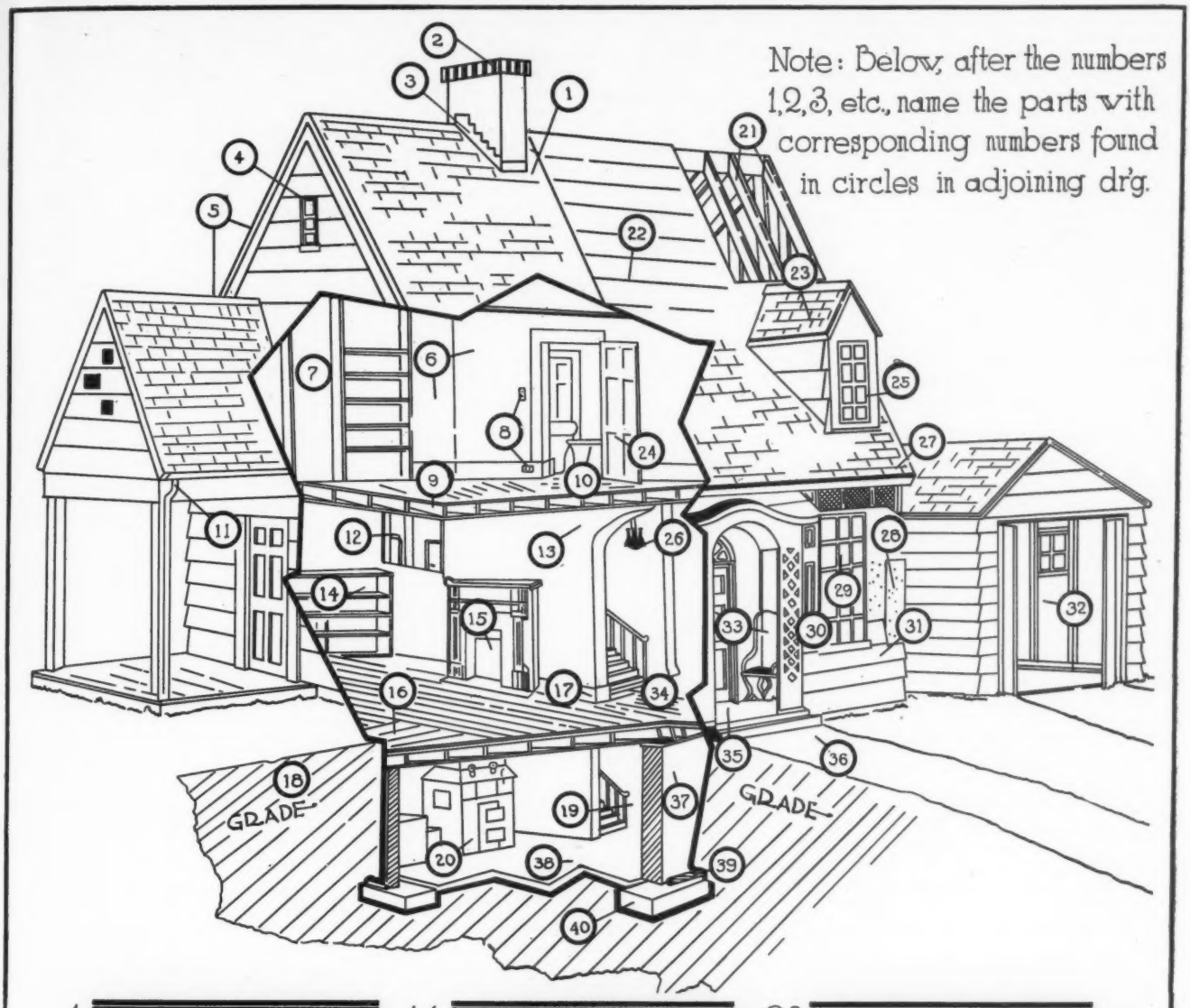
To Find	Given	Formulas
A.	B.C.	$180° - (B+C)$
Tan. A.	a.b.C.	$\frac{a \times \sin C}{b - a \times \cos C}$
Cos. A.	a.b.c.	$\frac{b^2 + c^2 - a^2}{2bc}$
Sin. A.	a.c.C.	$\frac{a \times \sin C}{c}$
Sin. A.	a.b.B.	$\frac{a \times \sin B}{b}$
Tan. A.	a.c.B.	$\frac{a \times \sin B}{c - (a \times \cos B)}$
B.	A.C.	$180° - (A+C)$
Sin. B.	a.b.A.	$\frac{b \times \sin A}{a}$
Cos. B.	a.b.c.	$\frac{c^2 + a^2 - b^2}{2ac}$
Tan. B.	b.c.A.	$\frac{b \sin A}{c - (b \cos A)}$
Sin. B.	b.c.C.	$\frac{b \sin C}{c}$



To Find	Given	Formulas		Given	To Find
a.	c.A.C.	$\frac{c \sin A}{\sin C}$	$\frac{a \sin B}{\sin A}$	a.A.B.	b.
a.	b.A.B.	$\frac{b \sin A}{\sin B}$	$\frac{c \sin B}{\sin C}$	c.B.C.	b.
a.	b.c.A.	$\sqrt{b^2 + c^2 - (2bc \times \cos A)}$	$\sqrt{c^2 + a^2 - (2ac \times \cos B)}$	a.c.B.	b.

Formulas	Given	To Find
$180° - (A+B)$	A.B.	C.
$\frac{c \sin A}{a}$	a.c.A.	Sin. C.
$\frac{c \sin A}{b - (c \cos A)}$	b.c.A.	Tan. C.
$\frac{c \sin B}{b}$	b.c.B.	Sin. C.
$\frac{c \sin B}{a - (c \cos B)}$	a.c.B.	Tan. C
$\frac{a^2 + b^2 - C^2}{2ab}$	a.b.c.	Cos. C
$\frac{a \sin C}{\sin A}$	a.A.C.	c.
$\sqrt{a^2 + b^2 - (2ab \times \cos C)}$	a.b.C.	c.
$\frac{b \sin C}{\sin B}$	b.B.C.	c.
$\frac{a b \times \sin C}{2}$	a.b.C.	Area $s = \frac{1}{2}$ a+b+c
$\sqrt{s(s-a)(s-b)(s-c)}$	a.b.c.	

This trigonometry chart, arranged for ready reference, was submitted by Norman W. Morgan, Technical High School, Scranton, Pa.


Note: Below, after the numbers 1,2,3, etc., name the parts with corresponding numbers found in circles in adjoining dr'g.
GRADE
GRADE

1 2 3 4 5 6 7 8 9 10 11 12 13

14 15 16 17 18 19 20 21 22 23 24 25 26 27

28 29 30 31 32 33 34 35 36 37 38 39 40

Architectural Drawing Test. Submitted by R. J. Watson, South Hills High School, Pittsburgh, Pa.

(Continued from page 204)

mately .6 of a board foot. The same line followed upward to the cost table shows the total cost of the piece to be 5 cents at the price rate of 8 cents a board foot.

The plotting of the curves may be done as shown in Figure 3. A piece of wrapping paper 2 by 3 ft. is marked off in squares two tenths of a foot on a side. Each small square will then have an area of .04 of a square foot. The numbers, placed at the intersections of lines forming the sides of the squares in Figure 3, are the respective areas of the rectangles, below and to the right of the intersection, formed by the two intersecting lines and the guide strips of the measuring device.

In Figure 3 a curved line is drawn through all points representing .4 of a square foot. It will be seen that a rectangle placed in the lower right-hand corner of the device, the exposed corner of which touches the curved line at any point, will have an area of .4 of a square foot. A line is now plotted on the wrapping paper through all of the one-tenth points. Another line is plotted through the two-tenths points, anther through the four tenths, the six tenths, and every even tenth thereafter.

After all the curved lines are prepared on the wrapping paper it is carefully placed in position on the painted surface of the measuring device and a row of points pricked through the paper into the wood along each curved line. After the paper is removed the pricked points serve as a guide for painting in each stripe. The stripes are 1/16 in. broad.

The board-foot lines begin with one tenth square foot, two tenths, and every two tenths thereafter. The even feet are shown by heavier lines. More lines than this make for confusion. The odd tenths may be quite accurately estimated. The numbers indicating the size in board feet are placed in a vertical column on the left-hand border of the device, as shown in Figure 1.

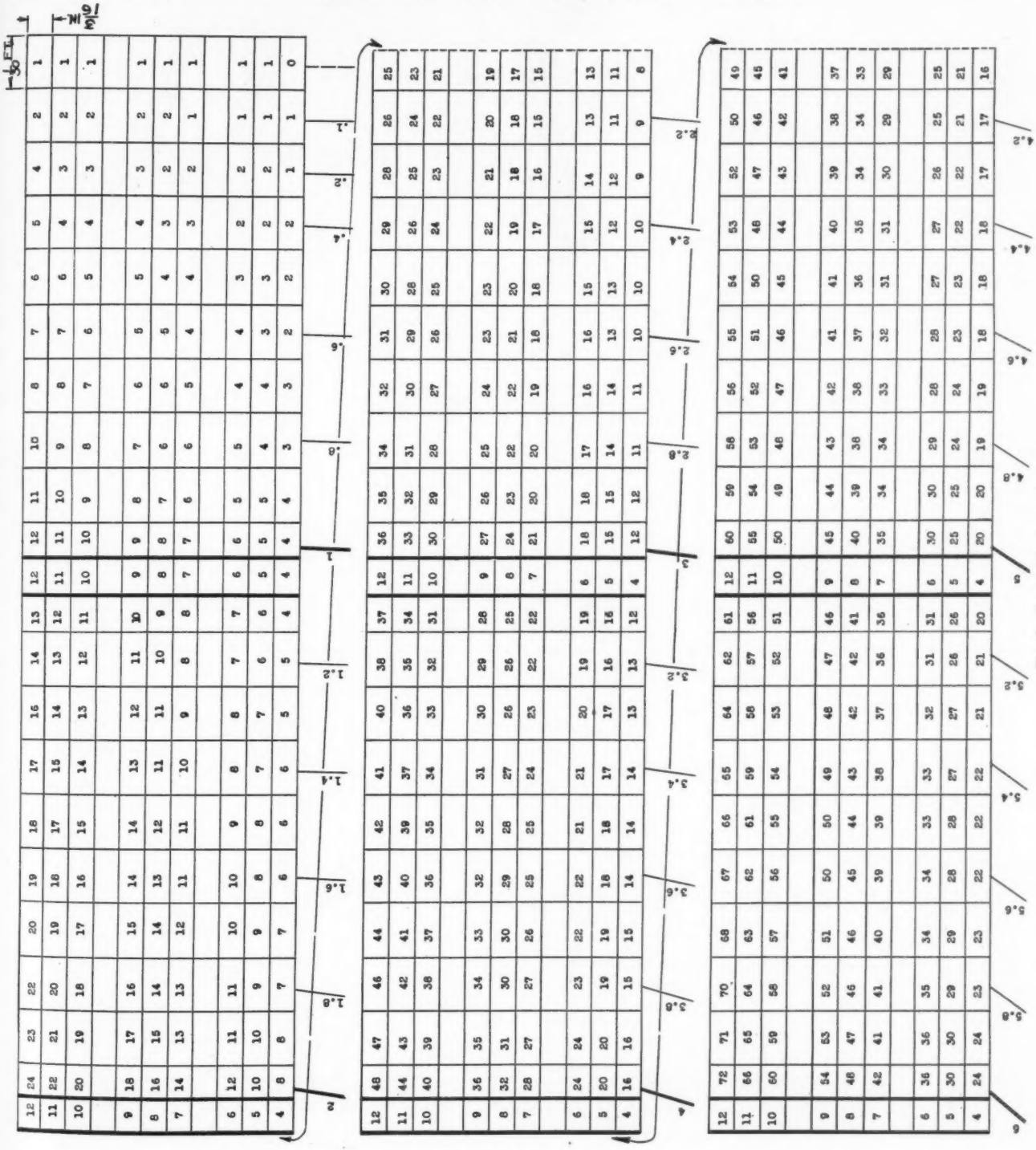


Fig. 2. Cost table (actual size)

The cost table, shown in Figure 2, is placed horizontally in the top border. Costs are calculated to the nearest cent on prices ranging from 4 to 12 cents inclusive. Prices per board foot or square foot are enclosed within pairs of heavy vertical lines. Although there is a plotted curve only for every two tenths of a board foot, there is a vertical cost column for every one tenth of a board foot. To make easier reading the horizontal rows are grouped in threes. The board measure scale and the cost table are prepared for materials 1 in. thick or less. For 2-in. material the values indicated are doubled, for 3 in. they are tripled, etc. For prices more than 12 cents a board foot the cost may be determined as a multiple of an indicated value or the sum of two indicated values. For example, at a 15-cent price the cost could be taken as three times the cost at 5 cents or the sum of the costs at 7 cents and 8 cents.

This measuring device has been used for four years by seventh-, eighth-, and ninth-grade boys. Five minutes' instruction in its use to the student-supply foreman is sufficient and the others learn from him.

It is admitted that the use of this device does not compel the student to measure and estimate his materials, but it does save much time for the instructor and students and greatly reduces chance of error in the measurement of odd-size pieces.

WORN, FEUDAL-OAK RADIO OR FIRESIDE BENCH

C. Forrest Felix,

Johnstown, Pa.

This bench is a very fine project for junior high school shops. Since the first bench was designed in 1936 the Garfield Junior High School hand woodwork shop has turned out about 125 of these benches.

Material: Oak

4 pc. 1⅛ x 2¼ x 18"	Legs
2 pc. 1⅛ x 2¾ x 12"	Crossbar for legs
1 pc. 1⅛ x 2 x 28"	Stay brace
2 pc. 1⅛ x 2¼ x 12"	Top bar for legs
1 pc. 1⅛ x 11 x 24"	Top
2 pc. 1⅛ x 2½ x 24"	Sides for top cut to shape
2 pc. 1⅛ x 1½ x 11"	Warp strips on end of top
16 Screws, f.h. 1½, No. 10	Warp strips and legs to top
8 Screws, f.h. 2, No. 10	Top bar to legs
2 Screws, r.h. 1½, No. 10	Stay brace

The top may be hollowed out or may be steamed and bent to shape. After steaming it should be allowed to dry for a week or 10 days. Then cut the sidepieces to the shape of the top piece and fasten them in place with glue and 1½-in. brads. Then glue and screw on the pieces at ends of top. Round and shape ends and sides from center, and taper to ends and corners. Cut deeper in center than at ends.

The legs must be shaped, cut, and finished before assembling. The legs involve two mortise-and-tenon joints of angle shape, and two dado joints at the top which are assembled with two screws in each leg. When assembled, fasten with screws to top. The stay brace is bent or cut to shape in the same manner as the top.

Shape legs and stay brace with drawknife. Do not try to get all the drawknife marks out, when sanding, as this adds to the antique appearance when finished. All corners are rounded. A course cabinet file can be used to good advantage.

The finish is gotten by using a medium dark mission-oak oil stain. When dry, give a thin coat of dull varnish. Let dry. Then mix white lead and turpentine to a creamy thickness. Apply so that it works into the grain. Then rub off and clean across the grain. Let dry. Then give a finish coat of dull or satin finish varnish. Let dry and wax.

If gloss varnish is used it should be rubbed down with water and pumice stone to a dull finish.

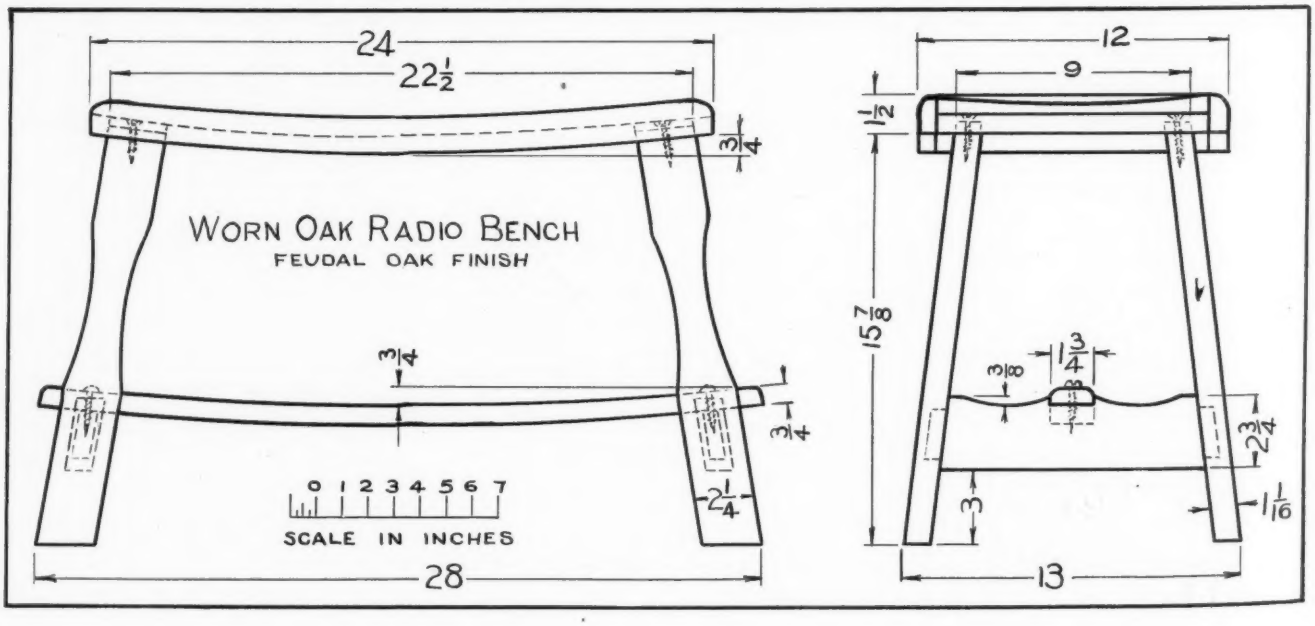
10-FT. SAILING SURFBOARD

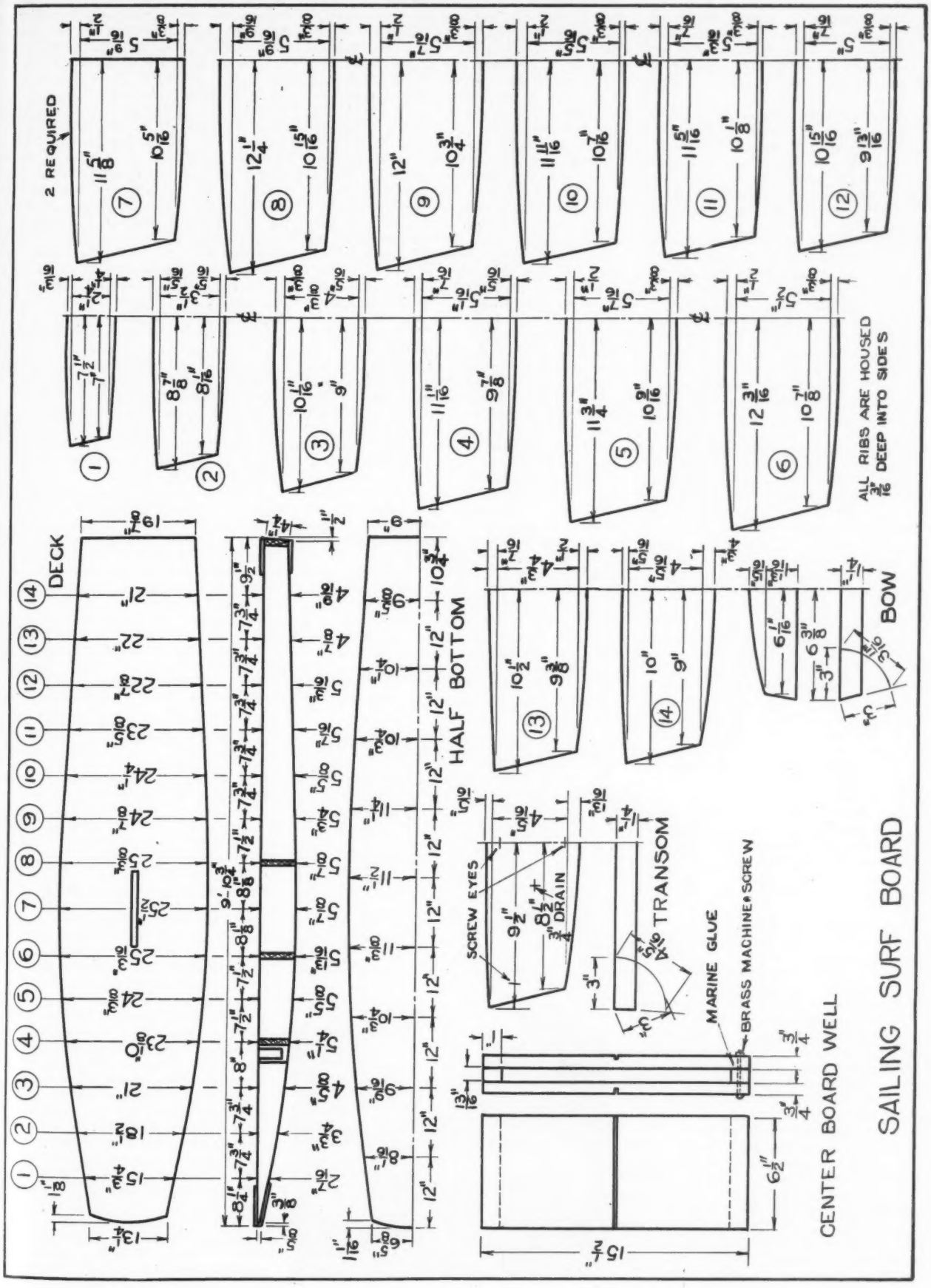
James McGregor,

Polytechnic Elementary and Junior High,

Pasadena, Calif.

Time, ability, and cost are three of the many deciding factors, when selecting shop projects. There are many boys who have interests that are more than just passing fancies, but who, for lack of sufficient funds of their own, or lack of funds, faith, and interest on the part of parents, are denied the privilege of carrying out their interests. The one question which is always with us, is, what will it cost? The sailing surfboard or skiff, illustrated and described herewith is




SAILING SURF BOARD
2 REQUIRED
ALL RIBS ARE HOUSED 3/16" DEEP INTO SIDES
DECK
HALF BOTTOM
BOW
TRANSOM
SCREW EYES
DRAIN
MARINE GLUE
BRASS MACHINE SCREW
CENTER BOARD WELL

within reach of the pocketbook of many, and presents one method of catching the prevailing interest and enthusiasm of boys in aquatic sports. Ideas are born from interest and enthusiasm, and if we do not encourage the latter we are not likely to catch many of the former.

This boat is strongly constructed, and makes use of one of the comparatively new materials of industry. There is no cockpit, the operator simply lying in a prone position. A boy who contemplates this project or any other boat should be able to swim and handle himself well in the water for any emergency which may arise.

Sizes given in the accompanying drawings show the true length and true width for the sides, but do not include the thickness of deck and bottom. Sizes for deck and bottom indicate the full outside dimensions.

Sides are made of straight-grained material free from all defects to facilitate bending. These are marked in pairs according to shape. The position of the ribs must be carefully laid out. The ribs should be housed 3/16 in. deep to fit ⅛-in. prestwood with the exception of ribs 4, 6, and 8, which are of ¾-in. spruce.

Bow and transom are next made, and side and edge bevels must be marked and cut very accurately, because they determine largely the symmetry of the complete job. Hardwood is better than softwood for the former, to enable the screw fastenings to hold well. Ribs 6 and 8 are then marked and cut to shape.

The first assembly is then made. This consists of sides, bow, and transom. A ¾ by 6-in. temporary spreader is used to hold the sides apart at rib 7. Sides are glued with casein glue and screwed into bow and transom. Clamps are desirable while doing this part of the job to make sure of tight joints. They also help considerably in forming an equal bend on each side. After cutting ribs 4, 6, and 8, to shape, a trial should be made with these clamped tightly in place. This is necessary because should the width of the boat be too wide at ribs 6, 7, and 8 there will not be enough material to cut deck and bottom from one sheet of prestwood as planned in the drawings. Therefore, before fastening ribs 4, 6, and 8 for good, lay out deck and bottom patterns on material as shown in drawings, checking with the partly assembled boat, comparing sizes, and making any change in lengths of ribs 4, 6, and 8, before these are finally glued and nailed in place.

The remaining ribs of the boat may then be made. Due to the dark color and hard nature of prestwood, a set of patterns for those ribs, made from discarded posters or other available cardboard are of great assistance, and give the student a good workout in laying out templates. Before cutting the ribs to proper length, it would be well to again check the sizes of these at respective places in the partly assembled boat. If ribs are not fitted carefully there is trouble. The only fastening used is glue and a good close joint. If ribs are too short they will not hold, and if too long, they will bend at the center.

After finishing the ribs, work on the centerboard well is next in order. A dado joint is cut on each side of the centerboard well to receive the two half ribs 7. The opening in the centerboard well should be made according to the thickness of material to be used for the actual centerboard, allowing for clearance and the addition of paint. Before assembling the well, the inside surfaces should be painted. Brass machine screws, and a coating of marine glue at the joints will hold the parts securely, and make watertight joints which are essential. The completed well is, of course, held in place by brass screws through ribs 6 and 8.

The mast block is made from a piece of 3 by 3 in. placed on end. The thickness of the mast has to be decided at this point. For a 1¾-in. mast at the bottom end, the size of hole in the mast block will also be 1¾ in. with clearance. Another method of making the mast block is to use ¾-in. material, filled in between ribs 3 and 4, one piece across under deck, and another close to the bottom. This latter method is suggested for those who prefer to have extra fittings for rigging or stays on the deck, thereby building a solid place for fastenings near the mast.

It also is necessary to provide means for draining water from the inside. Triangular pieces ½ by ½ in. are cut with chisel at the four corners of each rib. A ¾-in. hole is bored in the transom 2½ in. from the bottom edge, either at the center or to one side. Over this hole a galvanized waste nut with plug is set in white lead and screwed in place. This drain plug in addition to acting as a drain, also acts as a breather cap, and should be removed when the boat is out of the water to allow for the expansion of air between the bulkheads. On a warm summer day, when the boat is left out of the water exposed to the sun for a long period, expansion of the air may be so great as to cause swelling of deck and bottom with the possibility of springing some joints. Two triangular corner blocks fitted close and glued inside between transom and sides will aid in draining water, and help to prevent water from lodging at corner joints.

The bottom edges of sides, bow, and transom, should be planed off flush, and beveling of these parts will be necessary to conform to the curves on the bottom of the ribs. There are no short cuts here, but keep in mind that a close-fitting seam between bottom and sides is necessary. The prestwood bottom may be laid out to shape from the drawings, allowing a little extra for trimming, or, the bottom piece may be clamped in place and marked to fit the assembly. In any event the bottom should be given a trial fit and clamped in place to find out if joints are close. When this is done cotton tape is stretched along the edges of the sides, also at bow and transom and set in marine glue. Another layer of marine glue is spread over the tape before proceeding. Clamping bottom at the center of the boat first, and working toward bow and stern is the best method of preventing any possible bulging. Fastening is accomplished by means of 3*d* galvanized finish nails placed 1 in. apart. In nailing as in clamping it is better to start at the center of the boat and work toward bow and stern. Surplus glue which has come out at the joints may now be wiped off, so as to avoid too much adherence to planes while smoothing off the surplus edge of the bottom.

Two coats of good lead paint should be applied to the complete inside of the boat, and the underside of the deck.

Mast, deck, and rudder fittings have been reduced to a minimum in this boat to keep down the cost. If additional fittings are desired, preparation for them will have to be made at this stage of construction.

If side stays are used on the mast, provisions for fastening them are required on the deck. This can easily be done by bolting a piece of 1 by 6-in., 18-gauge galvanized iron to each side of the boat, 8 in. aft of the mast. A hole drilled in the end of each plate will provide a fastening for a swivel eye snap on the end of each stay.

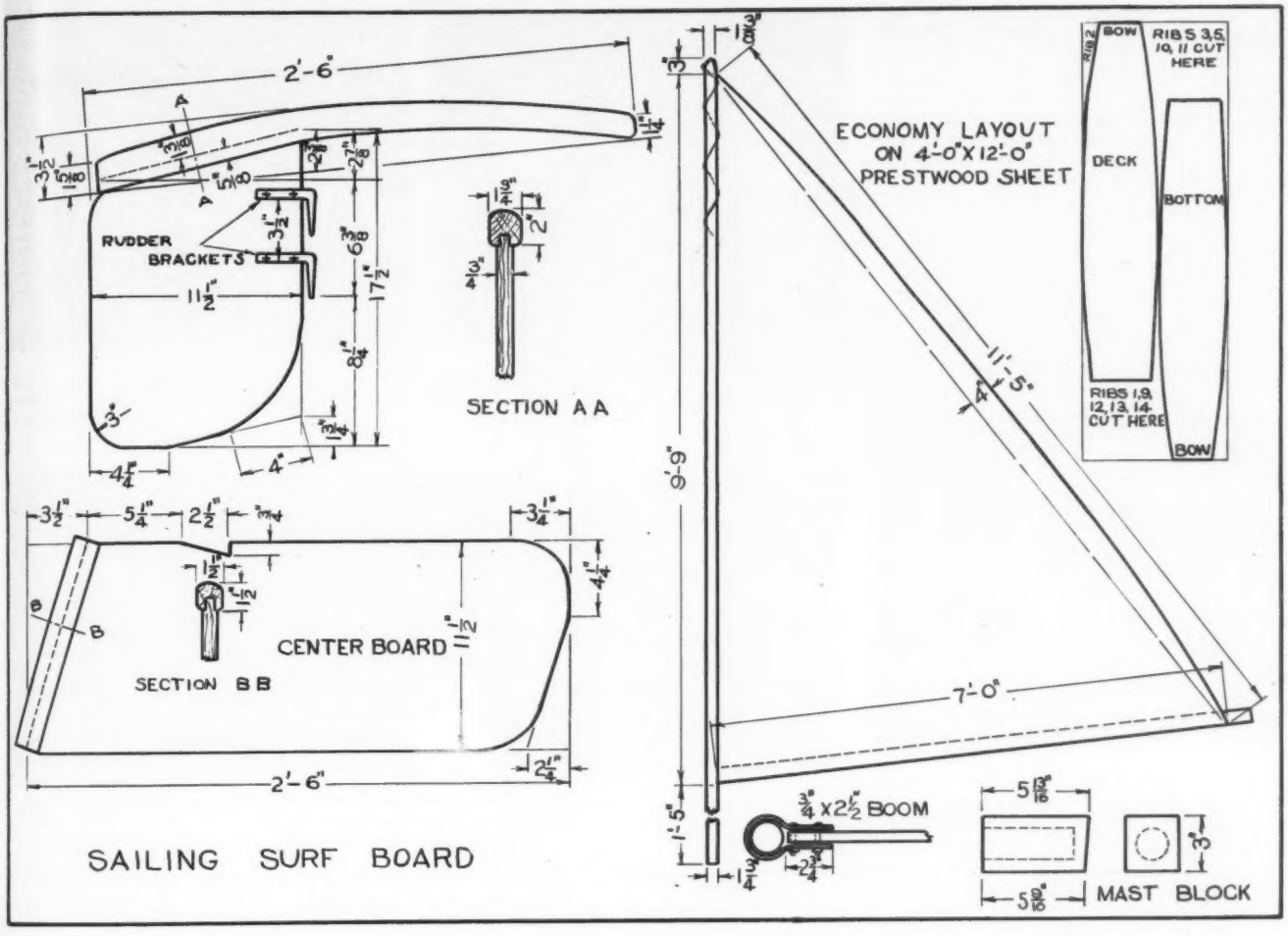
To put on a sail which can be hoisted up and down requires cleats on the deck, a mast-eye band at mast top, and a swivel pulley. If this is desired those cleats have to be fastened on the deck before it is nailed down. A ¾-in. piece of pine or spruce glued on the underside of deck at each location makes a good place to screw or bolt cleats.

Examine inside of the boat and be sure there are no loose nails or tools left there. The deck is prepared and nailed in place in the same manner as the bottom.

Finishing off the outside of the boat is the next step. All nails should be examined, and although setting of these in the deck and bottom is not recommended, they should be hammered down flush. Experience has shown that there is a preference on the part of some boys to put the deck on with the rough side of the material out. This is supported by the statement that the rough side affords a better grip to a wet bathing suit.

The priming coat of paint can now be applied to the finished hull. Since there is little penetration of paint into prestwood, thinning should be done entirely with pure turpentine. By alternating painting with the making of mast, boom, rudder, and centerboard ample time is given for paint to dry thoroughly. The builder is again cautioned that thorough brushing out, and almost scanty application is necessary, because of the properties of tempered prestwood.

The centerboard top is made from a piece of good hardwood, and the blade from spruce, which is housed into the top. Rudder and tiller are of similar materials and construction, fitted tight and held with casein glue. The notch in the centerboard is to prevent the board from floating out of the centerboard well. The rudder is held in place with two galvanized brackets which fit into two galvan-



ized eyes screwed into the transom. Brass screw eyes may be used in place of galvanized eyes. Instead of painting all parts of centerboard and rudder, tiller and top of centerboard may be treated with clear varnish, bringing out the natural color of the wood, and enhancing appearance.

A good straight-grained piece of spruce is tapered and rounded for the mast. The boom is also of spruce, and for simplicity is not rounded, but fits into a wide hem in the sail. Mast and boom are held together with galvanized strap iron formed to shape. A piece of leather tacked around the mast where the boom fitting touches, will prevent chafing of wood.

A ⅜ by 2½-in. galvanized eyebolt fastened at the bow will be useful for tying up at landings, and for those who have included mast stay ropes in their construction, it will also serve as a place to secure the forestay from bow to mast top. The sail is held to the mast with ¼-in. rope looped through gromets. A rope traveler is fastened to two screw eyes in the transom. The sheet may be controlled by a small pulley on the end of the boom, and a ring on the traveler rope. Another method is to bore a hole in the end of the boom, through which to pass the sheet, and having a cleat on deck at the stern.

No serious difficulties have been encountered in building these sailing surfboards with ninth-grade boys, except in the painting, where in spite of many instructions the paint has been applied too thickly.

Bill of Material

No. Required	*Name*	*Material*	*Size*
2 pc.	Sides	Straight-grained spruce S4S	⅝" x 6" x 12'-0"
1 pc.	Bow	Hardwood S4S	1¼" x 2¾" x 1'-3"
1 pc.	Transom	Hardwood S4S	1¼" x 5½" x 1'-9"
1 pc.	Ribs 4, 6, 8	Straight-grained spruce S4S	¾" x 6½" x 6'-0"
1 pc.	Ribs 7	Tempered prestwood	⅛" x 6½" x 2'-0"
1 pc.	Deck bottom, and other ribs	Tempered prestwood	⅛" x 4'-0" x 12'-0"
1 pc.	Centerboard well	Straight-grained spruce S4S	¾" x 6½" x 2'-9"
1 pc.	Centerboard well	Straight-grained spruce S4S	13/16" x 1" x 1'-3"
1 pc.	Mast block	White pine	3" x 3" x 0'-6"
1 pc.	Centerboard	Spruce S4S	¾" x 11½" x 2'-9"
1 pc.	Centerboard	Hardwood S4S	1½" x 1½" x 1'-0"
1 pc.	Rudder	Spruce S4S	¾" x 11½" x 1'-6"
1 pc.	Rudder	Hardwood S4S	1¾" x 3½" x 2'-6"
1 pc.	Mast	Straight-grained spruce	2" x 2" x 12'-0"
1 pc.	Boom	Straight-grained spruce	¾" x 2½" x 7'-0"

No. Required	*Name*	*Size*
18 yd.	White cotton tape	½"
¼ pt.	White marine glue	
1 lb.	Casein glue	
2 lb.	Galvanized finish nails	3d
2 doz.	Screws	1½", No. 8 f.h. brass
4	Screw eyes	No. 1104, brass
2	Galvanized rudder brackets	½"
1 pc.	Galvanized iron	1½" x 12", 14 gauge
2	Stove bolts	¼" x 1¼", r.h.
6	Machine screws	3/16" x 2¾", r.h. brass
1 doz.	Washers	3/16", brass
30 ft.	White cotton rope	¼"

Sail of lightweight canvas with gromets, made to fit sail pattern.

It is well, therefore, to remember that the paint should be applied sparingly, that each coat must be permitted to dry hard, and finally to let the final coat dry specially hard, before that most interesting part, the launching.

Painting Specifications

1st coat, best grade ready-mixed outside white, thinned with pure turpentine.
2nd coat, best grade ready-mixed outside white, not thinned.
3rd coat, japan color thinned with airplane spar varnish, and just enough turpentine to make the paint brush out smooth. (One pint of japan color to one pint of varnish.)
4th coat, repeat as for coat 3.

1⅛ pints pure turpentine.

Formula for those who prefer to mix their own paint, in place of the ready-made outside white:
6 lb. white lead soft paste.
¾ pint spar varnish.
⅜ pint liquid drier.

The above will make ⅜ of a gallon, and is enough for the two priming coats; the remaining two being the same as those given in painting specifications.

SOAPBOX DERBY

Bill Horrell,
Carbondale, Ill,

Sixth-grade pupils in the Allyn Training School staged a soapbox derby on the Southern Illinois Normal University athletic field last year. Under the direction of Delmar W. Olson of the college industrial-arts depart-

Fig. 2. "Line inspection"—The students put the finishing touches to their car before the race

Fig. 4. Receiving the trophies. Trophies consisted of tin cans with handles soldered on them

Fig. 1. Fixing the steering wheel. The instructor only gives advice and help when asked. The designs were worked out by the students

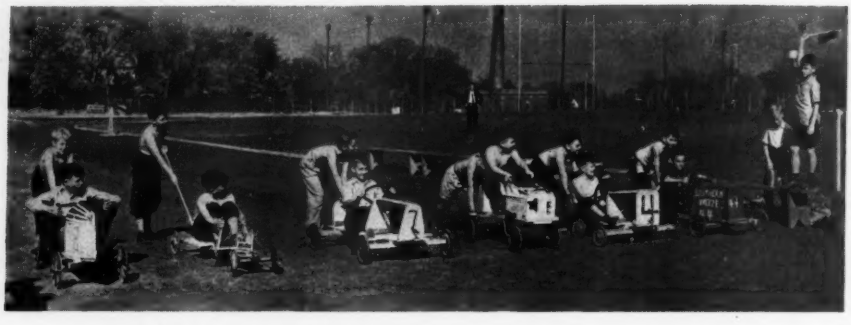
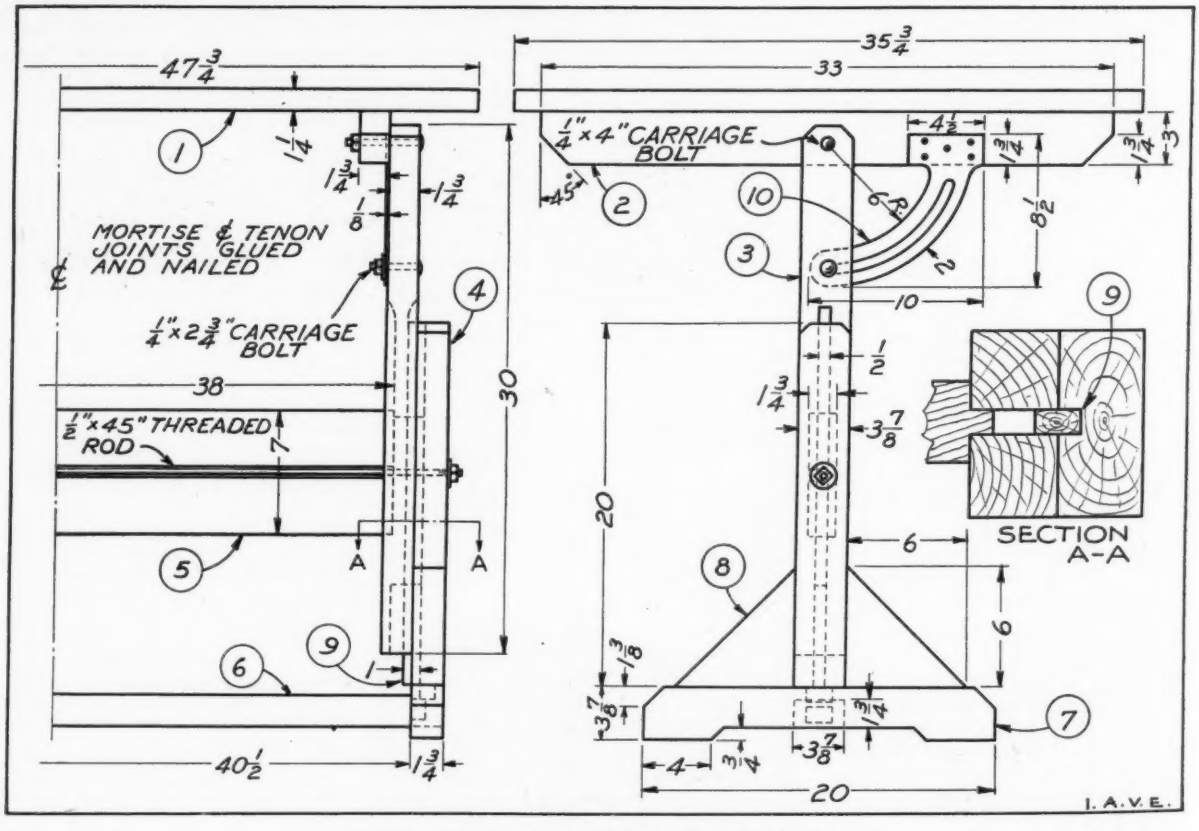


Fig. 3. Ready for the take-off. All procedures were carried out as those of the big races—starting flag, finish flag, and trophies



Drawing table, submitted by Roy Alger, McGill, Nevada

ment, the pupils built the cars in industrial-arts classes, assembling the parts, and doing the painting.

Two boys entered the derby for each participating car, alternately pushing and driving the car. At each quarter mark, the boys changed positions, the driver becoming the pusher, and the pusher becoming the driver. Unlike most soapbox derbies, the one held at Southern was run on a level track instead of on a hill.

The winners of the derby, Bobby Brown and Jimmy Renfro, received loving cups, made by the industrial-arts pupils.

VISUAL INSTRUCTION IN WOOD FINISHING

Robert H. Wright,
Public Schools,
Fort Smith, Ark.

The use of the senses, especially those of touch and sight, help one to form an opinion as to the success or failure of a finished school project. The finishing steps determine to a large extent the value which the student places on the project as well as on the information and experience which he has gained while making it. The wood-finishing cabinet described herewith, was designed and constructed in order to help form these desirable opinions.

The reasons for attempting to develop this visual teaching aid are:

1. It was realized that a problem affecting the finishing procedure needed to be solved.
2. The students did not realize a need of better finishing technique.
3. The pupils did not properly prepare the surfaces for finishing.
4. The students were using expensive materials with poor results.

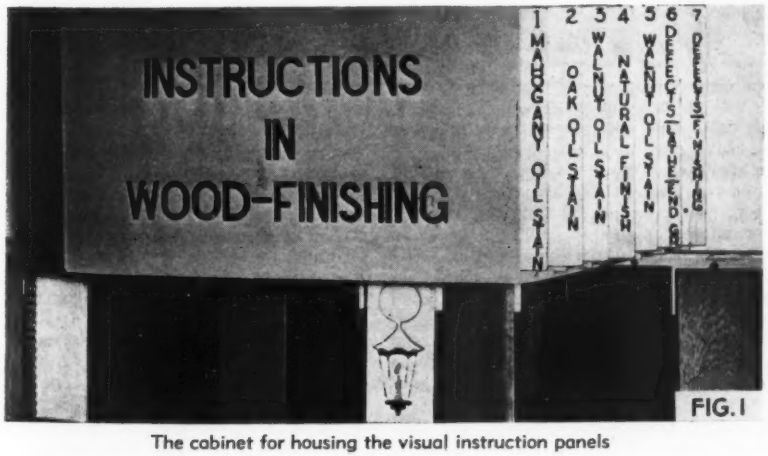
The problems that had arisen in the finishing room were used as criteria for judging effectiveness in the use of the visual instructional materials. The teaching device shown in Figure 1 was planned to fulfill the following recognized instructional needs:

1. To furnish a device for student self-evaluation.
2. To familiarize the student with first-class finishing and finishing methods.
3. To require students to make decisions, or to rely on their own judgment after a concrete comparison.
4. To make readily accessible instruction sheets.
5. To set standards of workmanship.
6. To present what can be done with what is at hand in equipment and materials.
7. To enrich the students' knowledge as to the nature of trees, their growth, and properties.

By an analysis of instructional needs it was found that there was a need for seven panels in the box. The selection of information, with the number of slides and content on each, will depend, of course, on how essential the material is, the number of cases occurring, and the frequency of defects occurring in the final finishes. Figure 1 shows the box with seven slides. Each slide is extended far enough beyond the edge of the one in front, to permit the reading the title of the instructional unit

A student using the panel on mahogany

The panel showing defects that are to be avoided. At A are shown sanding defects; B, end grain not sanded properly; C, poor lathe work; D, properly and improperly prepared end grain



The cabinet for housing the visual instruction panels

on the slide pull. The box is 31¼ in. long at the back and 24¼ in. at the front. It is 14 in. high and 10 in. deep. The slides are made of three-ply paneling which work in grooves cut along the top and bottom of the box.

The information on each slide is divided into four divisions. An explanation of the four divisions of Slide I, pictured in Figure 2 is given here: *Title: Mahogany Wood; Mahogany Oil Stain.*

Facts About the Wood

1. Mahogany grows best and is most numerous in Mexico, Honduras, and the West Indies.
2. The tree reaches maturity in a period of 200 years and attains a height of 50 to 90 ft., with a diameter of from 5 to 12 ft.
3. The color of the heartwood is red-brown and the sapwood is yellow in color.
4. It is a heavy, strong, and very hard wood, works well and is very durable.

5. Mahogany has a porous grain, and is an open-grained wood.
6. The wood has been used for many years in fine furniture, veneer finishing, and other interior work.

Preparing the Surface for the Finish

1. After the surface has been planed and scraped it should be assembled into the project.
2. Sand well with No. 1 sandpaper.
3. After sanding with No. 1 sandpaper, sand well with 1/0 sandpaper.
4. Sponge the entire project with a soft cloth. Use water or water with a few drops of glue added for a sponging liquid. After the wood is thoroughly dry, sand carefully with No. 2/0 sandpaper.

Finishing Procedure

1. Remove all dust or other foreign particles from the wood.
2. Apply a coat of Mahogany Oil Stain.
3. Allow to dry at least 24 hours.
4. Apply a generous coat of wood filler (stained).
5. Allow the filler to dry for 24 hours.
6. Sand off any rough filler spots when the filling coat is dry. Use a worn piece of No. 2/0 sandpaper.
7. Dust off well.
8. Apply a thin coat of shellac. Use ½ shellac, ½ alcohol. Let dry for 8 hours.
9. Sand carefully with No. 2/0 sandpaper. Dust off.
10. Apply a coat of rock spar varnish, slightly thinned. Let dry for 24 hours.
11. Steel wool or sand carefully. Dust off.
12. Apply another coat of varnish. No diluting is necessary on this coat. Let dry for 36 hours.
13. Rub down slightly with steel wool and then rub the surface good with rottenstone and water.
14. Polish off.
15. Wax.

Questions

1. What is the action of rottenstone on a finish?
2. Why is most mahogany expensive?
3. Why sponge the naked wood with water?
4. Why should we steel wool with the grain?

Panel 6 in Figure 3 shows some common lathe and end grain defects. The arrow at *A* shows sanding rings as a defect and the card at the right of the sample gives the following information:

This defect was caused by sanding on the lathe. Sanding the project while it is on the lathe is a necessary step in the finishing of a lathe job, but it is also a necessary step to sand out the marks that go across the grain. These unsightly marks are one of the most common failures.

The arrow at *B* shows the concrete results of a project lacking enough sanding on the end grain. The card at the left of *B* imparts this information.

Sanding on the lathe is easy and will smooth most of the faceplate work satisfactorily, but to get the end grain smooth extra work will be necessary. If the end grain is pitted badly start sanding with No. 1½ sandpaper and work down to a final No. 2/0 sandpaper.

The arrow at *C* shows the effect in the appearance of an uneven bottom cut on the lathe. The card at the right of the turning says:

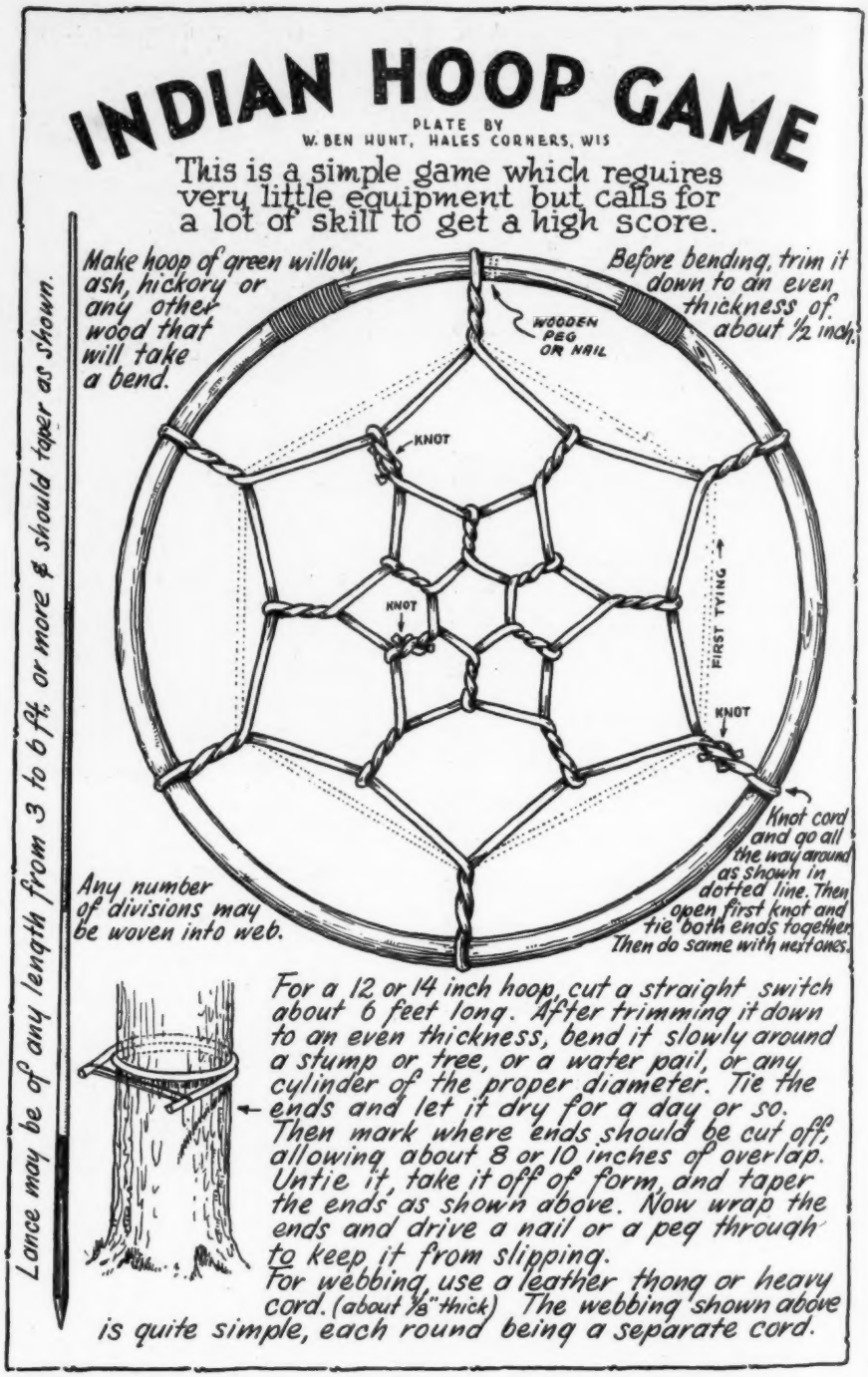
"This wavering and uneven bottom cut was the result of a hesitating finish cut. Sanding will not correct this defect; it will have to be recentered on the faceplate. A few well-guided cuts with the round nose tool will correct this fault."

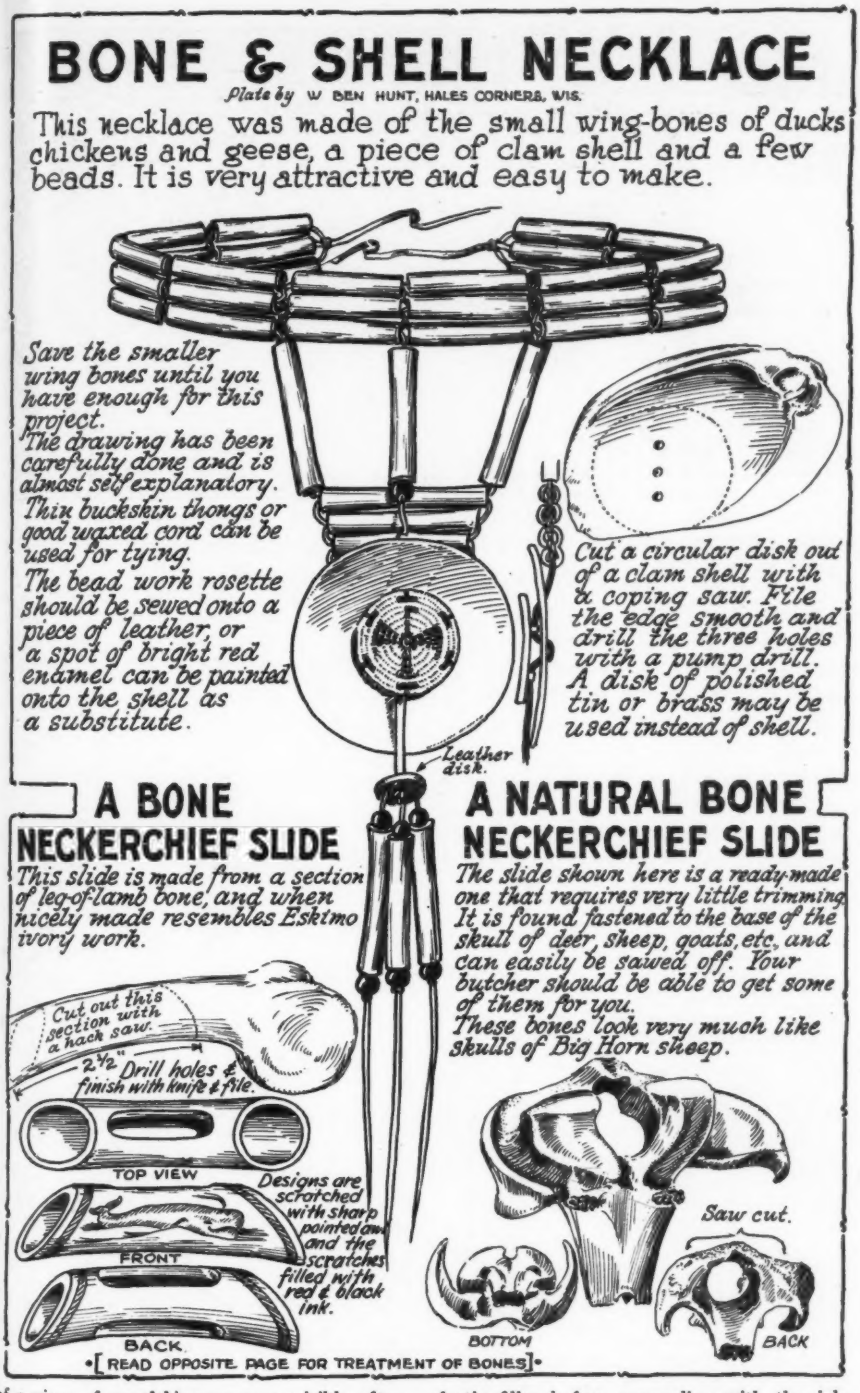
The arrow at *D* gives a comparison of end grains on four pieces. Two have been properly prepared, two have not. The card at the left of this defect explains:

"The most beautiful part on a piece of wood is the properly finished end grain. Until you can clearly see the natural color of the wood on the end grain you know that more sanding is necessary. If you plane the end grain and sand it, you will find that it is not hard to turn a white, cloudy end grain into the natural beauty of the wood."

The largest card in the middle of the slide deals with some challenging questions for the students' attention. They are as follows:

1. Explain how a dent in wood can be removed by applying a damp cloth and a hot iron over it.
2. What effect does scraping a board have upon the finished appearance?
3. Explain the cutting action of a plane iron or knife.
4. Give two or three points to remember when filling holes in wood with plastic cement.
5. Do we have to have pencil marks on the surface of our wood? How can they be removed?
6. What makes wood get dirty? Does a piece of white pine collect more dirt than a piece of walnut?
7. Why do sand scratches across the grain


INDIAN HOOP GAME
PLATE BY
W. BEN HUNT, HALES CORNERS, WIS
This is a simple game which requires very little equipment but calls for a lot of skill to get a high score.
Make hoop of green willow, ash, hickory or any other wood that will take a bend.
Before bending, trim it down to an even thickness of about ½ inch.
WOODEN PEG OR NAIL
KNOT
KNOT
FIRST TYING
KNOT
Knot cord and go all the way around as shown in dotted line. Then open first knot and tie both ends together. Then do same with rest ones.
Any number of divisions may be woven into web.
Lance may be of any length from 3 to 6 ft. or more & should taper as shown.
For a 12 or 14 inch hoop, cut a straight switch about 6 feet long. After trimming it down to an even thickness, bend it slowly around a stump or tree, or a water pail, or any cylinder of the proper diameter. Tie the ends and let it dry for a day or so. Then mark where ends should be cut off, allowing about 8 or 10 inches of overlap. Untie it, take it off of form, and taper the ends as shown above. Now wrap the ends and drive a nail or a peg through to keep it from slipping.
For webbing use a leather thong or heavy cord. (about ⅛" thick) The webbing shown above is quite simple, each round being a separate cord.


BONE & SHELL NECKLACE
Plate by W. BEN HUNT, HALES CORNERS, WIS.
This necklace was made of the small wing-bones of ducks chickens and geese, a piece of clam shell and a few beads. It is very attractive and easy to make.
Save the smaller wing bones until you have enough for this project.
The drawing has been carefully done and is almost self explanatory.
Thin buckskin thongs or good waxed cord can be used for tying.
The bead work rosette should be sewed onto a piece of leather, or a spot of bright red enamel can be painted onto the shell as a substitute.
Cut a circular disk out of a clam shell with a coping saw. File the edge smooth and drill the three holes with a pump drill. A disk of polished tin or brass may be used instead of shell.
Leather disk.
A BONE NECKERCHIEF SLIDE
This slide is made from a section of leg-of-lamb bone, and when nicely made resembles Eskimo ivory work.
Cut out this section with a hack saw.
2½" Drill holes & finish with knife & file.
TOP VIEW
FRONT
BACK.
Designs are scratched with sharp pointed awl and the scratches filled with red & black ink.
A NATURAL BONE NECKERCHIEF SLIDE
The slide shown here is a ready-made one that requires very little trimming. It is found fastened to the base of the skull of deer, sheep, goats, etc., and can easily be saved off. Your butcher should be able to get some of them for you.
These bones look very much like skulls of Big Horn sheep.
Saw cut.
BOTTOM
BACK
[READ OPPOSITE PAGE FOR TREATMENT OF BONES]

of a piece of wood become more visible after a finish has been applied?

Slide No. 7 has two panels, each of which is divided into four divisions by saw kerfs. These divisions deal with the eight most common defects that have been observed as failures in the finishing of students. The defects and their explanations are listed as follows:

1. *Plane marks as a defect in the finishing of wood.*

This defect is present because the jack plane blade was not properly adjusted. The plane can very easily be lined up by using the lateral adjusting lever. One good method of doing this is by sighting along the bed of the plane.

2. *Holes in wood as defects in the final finish.*

Holes such as this should be filled with a plastic filler before proceeding with the job. This plastic wood filler can now be bought already mixed to properly blend in color with the common kinds of wood. If you color your own filler consult your instructor before using.

3. *Scraping marks as a defect in the finishing of wood.*

These marks are the result of using a dull, nicked cabinet scraper. The blade should have been filed to a 45 deg. level, whetted, and drawn to a suitable burr edge with a burnisher. The burr should be discernible when drawing the finger along the edge. Scraping on open-grained wood is a very important operation in the finishing; the smooth, high portions of the stock must be scraped down to the level with the coarser, low portions.

4. *Sanding across the grain of wood as a defect in the final finish.*

To remove this kind of defect, it is necessary to sand completely through the finish to the wood beneath. Sanding across the grain is due largely to carelessness and should be avoided. Remember that it is necessary to stroke approximately twenty times with the grain to remove the scratches made by one stroke across the grain.

5. *Dirt as a defect.*

This defect is due largely to carelessness and too much handling. There is a thin film of oil on one's hands that is transferred to a board when it is handed. Dirt on a project seems of minor importance, but remember that this defect is as hard to sand out and correct as any other.

6. *Dents as a common imperfection in a finish.*

Dents can be removed and must be. A dent is merely the compression of wood. All the wood is still there and by putting water or by placing a damp cloth over the dent and then heating, the dent will swell back out to its normal position because the crushed wood cells or fibers drink in moisture.

7. *Glue as a common fault in the finish.*

Glue is a necessity on all projects where you have two or more pieces of wood joined together, but it is also as necessary that you remove all the excess glue before any finish is applied. It is well to remember also that stain will not penetrate even the thinnest film of glue to color the wood beneath. It is much easier to remove hard glue with a chisel than it is to wipe away hot glue.

8. *Pencil marks as a common failing in the finish.*

When laying out pencil lines on wood, be sure to make them very light. There is no other defect that detracts more from the appearance of a finished project than does a pencil mark.

Even though there are defects on the panels, each of the panels on Slide No. 7 have been finished as perfectly as have any other panels. A good deal of care was taken in applying the finish to these defective pieces just to prove to the students in language stronger than words, that you cannot possibly cover up pencil marks, dirty spots, sanding scratches, or any other of the eight defects, by going through an elaborate finishing procedure.

With this slide in use there is no selling of an idea to be done; a walk across the room with a student to actually see what his project will look like with those pencil marks on it is very convincing. By comparing the condition of his piece of work with the same condition on the panel, an instructor can make a forceful but very simple presentation to the pupil.

INDIAN HOOP GAME

W. Ben. Hunt,
Hales Corners, Wis.

Among some Indian tribes, the hoop game was as popular as lacrosse and throwing arrows were in others. The hoop and spears are easily made. The hoop may be made of green willow, ash, hickory, hazel, elm, or any other green wood. The hoop does not require actual strength as is the case with lacrosse sticks.

Indians usually made the webbing of rawhide, and while in some cases a simple four-part web was used, in other cases an elaborate pattern was woven similar to snowshoe webbing. The one shown is webbed with ⅛-in. twisted cord and the pattern is quite simple. The lance or stick used for throwing may be made of any straight shoot or twig. The game

is simple but it requires a lot of skill to get a good score quickly.

The hoop is rolled on a smooth flat plot of ground and the player throws his lance at it, trying to get the center opening if possible. The count varies with the type of webbing used. With this hoop, the count could be 5 for the outer openings, 10 for the next row, 25 for the next row which are quite a bit smaller, and 100 for the center opening.

Each player in turn takes one throw at the hoop, the one getting the most points in 10, 15, or 20 throws is the winner.

Rules can be made to suit. If the lance goes entirely through any of the openings it does not count at all, since there is no positive proof as to which one it went through. The lance may also be divided into four painted sections. Then additional points can be added according to which section of the lance is in the webbing when the hoop is stopped. The first section counting more than the end section.

WIRE RACKS FOR THE METAL SHOP

Einar E. Siro,

Minneapolis Public Schools, Minneapolis, Minn.

Dissatisfied with the conventional methods of storing wire in the metal shop prompted the design of the racks illustrated herein, which keeps the wire supply in a neat and orderly manner. Wire, when stored on these racks, is always accessible, and any amount may be removed without moving reels containing other sizes, or taking the reel off the rack.

In Figure 1 is shown a wire rack welded up out of old pipe. Figure 2 shows the same style of rack made out of old bed rails fastened together with rivets. The construction of the rack shown in Figure 2 is made clear through the detailed drawing in Figure 3, assembly drawing Figure 4, and the detailed drawing of the foot in Figure 5.

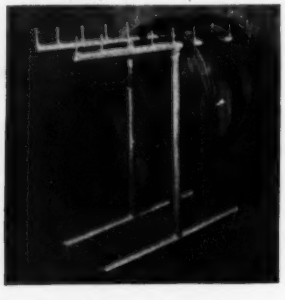


Fig. 1. Wire rack made as a welding project out of old pipe

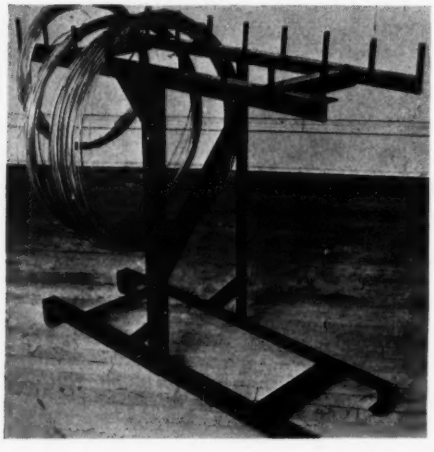


Fig. 2. Wire rack made out of old bed rails

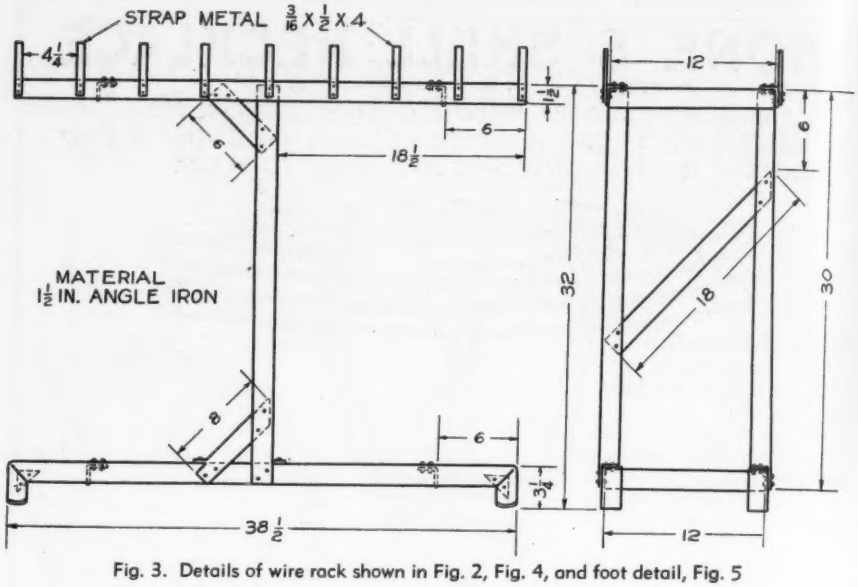


Fig. 3. Details of wire rack shown in Fig. 2, Fig. 4, and foot detail, Fig. 5

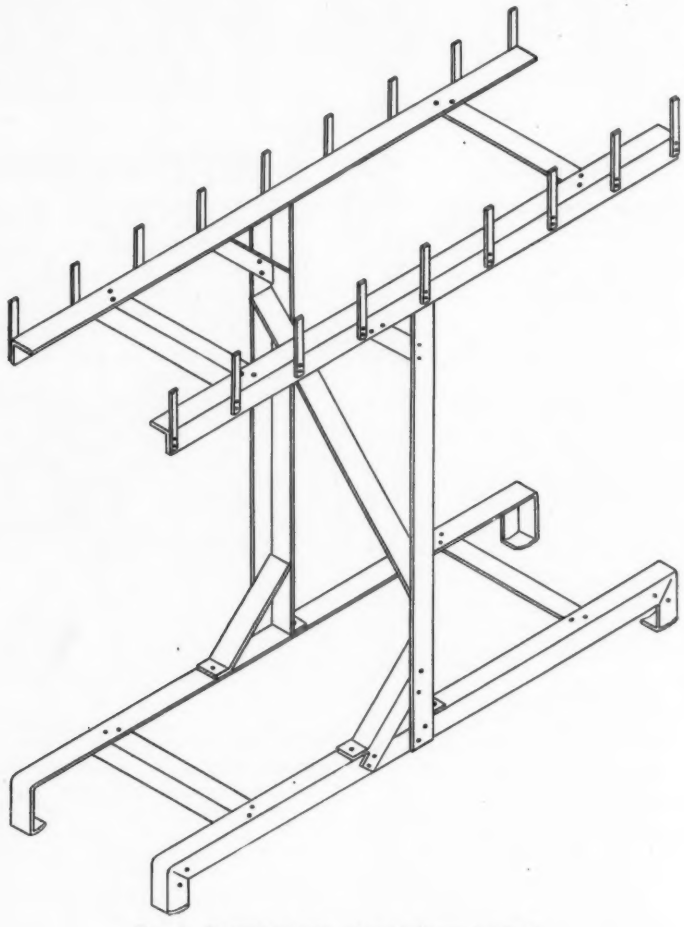


Fig. 4. Assembled view of rack shown in Fig 2

An assembly drawing of a rack designed to fit against a wall or bench is given in Figure 6. The same proportions and foot construction can be used in making this wire rack as for the one shown in Figures 2 and 3.

Where it is desirable to have the wire racks

(Continued on page 18A)

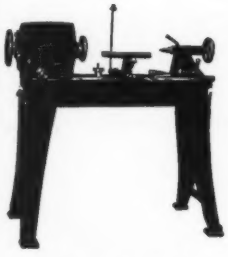
Grand Rapids, Mich. SCHOOL-SHOPS *USE*

"Oliver" Woodworking Machines

Approval and purchase of "Oliver" Woodworking Machinery by Grand Rapids, Michigan school shops, is an outstanding recognition of "Oliver" high standards of safety, utility, durability.

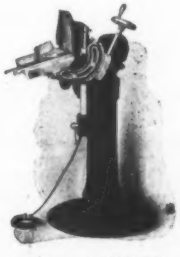
Important features responsible for "Oliver" Leadership in all parts of the country, are prominent factors in the progress and development of the woodworking departments in school shops — a development with which "Oliver" has been closely identified from the very beginning of Industrial Arts and Vocational Education.

The "Oliver" line comprises such products as Sawing, Planing, Jointing, Turning, Sanding, Boring, Mortising, Tenoning, Shaping, and Metal Spinning Lathes; also Wood Trimmers, Oilstone Tool Grinders, Vises, Glue Pots, Band Saw Blades, Circular Saws.



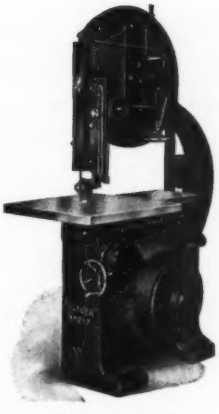
NO. 51 MOTOR HEADSTOCK LATHE

Thousands of school shops are combining efficiency with safety and convenience by using the "Oliver" No. 51 A. C. Motor Headstock Lathes. Speeds of 600, 1200, 1800, and 3600 R. P. M. make "Oliver" No. 51 lathes capable of all the flexibility and power necessary to produce practical work.



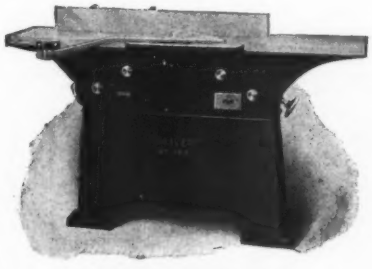
DISK SANDER

Motor driven sander which will give years of hard, satisfactory service. Several other types of sanders are also made by "Oliver."



BAND SAW

The protection and safety of the student in this new 30-inch Band Saw is positively assured, finding wide spread acceptance in the school shops everywhere.



HAND PLANER AND JOINTER

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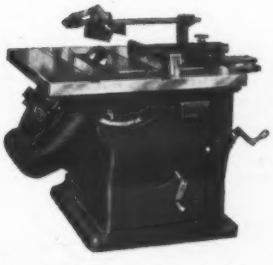

The "Oliver" Tilting Arbor Saw bench is unfailingly accurate, dependable, and easy in operation under the severest conditions.

An oilstone tool grinder that will give you long, dependable service at low cost.

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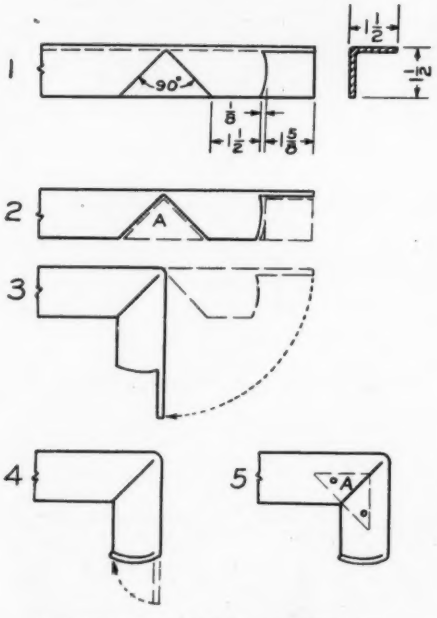
(Continued from page 218)

fastened directly to the wall, the type presented in Figure 7 will be found satisfactory. Care must be taken to fasten the rack securely to the wall, as it must support considerable weight when in use.

A great deal of variation is possible as to style, material, proportion, and method of assembly and fastening in making these racks. It is advisable to paint the rack to match the color scheme of the shop in which it is to be used.



HEATING EASES BENDING

Fig. 5. Detail of foot construction

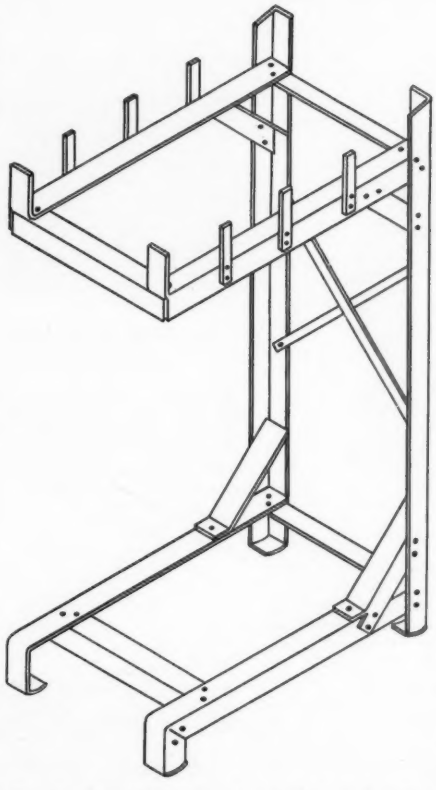


Fig. 6. Assembled view of rack designed to fit against a wall or bench

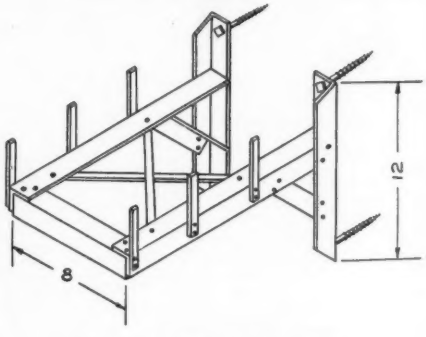


Fig. 7. Wall bracket wire rack

COLORING METAL

V. P. Conners,

**Christopher Gibson School,
Boston, Mass.**

(Continued from page 75, February, 1941, issue)

When a piece of work has been completed, the worker is confronted with the problem of finishing; the added cost of anything high grade is usually due to the finish.

In the following, the coloring of brass, copper, and aluminum by means of acid and heat will be discussed. This process of coloring is one which precedes the final finishing step.

(Continued on page 20A)

For young model builders Disston Small Saws make craftsmanship easier

One of the best ways to build up interest in a manual training class is to encourage model building... airplanes, ships, houses. Other pupils may advance to cabinet making. In any case, the budding craftsmen under your guidance will appreciate the better performance possible with Disston Small Saws.

Each of these Disston saws is made of tough, tempered Disston steel. Each is designed to do a particular cutting job exceptionally well.

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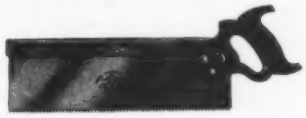
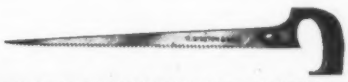


DISSTON No. 4 BACK SAW—Handiest of all small saws. Use it for fine joinery and cabinet work. Blade of Disston Steel—hard, tough. Teeth shaped for fast, accurate cutting. Back of extra-heavy, polished steel. Beechwood handle, weatherproof finish; brass screws. 5 sizes: 8" to 16" blades; 16 to 12 points.



DISSTON No. 2 COMPASS SAW—Open grip handle for easy control. Disston Steel blade, toothed to point. Taper-ground for clearance. Tempered to stand strain of curve-cutting. Applewood handle; Disston weatherproof finish; brass screws. 8 point. Sizes: 10, 12, 14, 16 inches.

DISSTON DOVETAIL SAWS Nos. 68, 70, 71—For dovetailing, tenoning, model building, pattern making...wherever finest possible joint is needed. No. 68 (illustrated) has straight handle. No. 70, open grip handle. No. 71, same as No. 68, with handle and blade offset to permit cutting with blade flush to board. All quite thin (26 gauge), with fine teeth (17 points). Sturdy brass-plated steel back supports Disston Steel blade.

DISSTON No. 10 COPING SAW—Frame of Disston Steel. 4½" from tooth edge of blade to inside of back. Hardwood handle. Nickel-plated ferrule, knurled stretchers. Blades available for cutting wood, bakelite, brass, celluloid, bone, composition board, copper, other metals.

DISSTON

TRAIN YOUR STUDENTS *with the Same Equipment Used by Industry*

★

● In training youths for industrial jobs, you must familiarize them with the operation of the equipment that's used in industry.

Wherever wood, metal or ceramic products are finished or coated, the spray equipment is predominantly DeVilbiss. In trades such as auto repairing, aeronautics, radio, electricity and printing, too, you'll find DeVilbiss Equipment leads. So install DeVilbiss Equipment in your shops.

Let DeVilbiss experience in meeting industrial needs help you plan more practical training along modern industrial lines.

Write for your copy of "The ABC of Spray Painting"—*FREE*

●

THE DeVILBISS COMPANY • TOLEDO, OHIO
Canadian Plant: WINDSOR, ONTARIO

DeVILBISS SPRAY SYSTEMS

(Continued from page 18A)

Before brushing any acid on any of the metals, be sure that the metal is absolutely clean.

To Clean Copper and Brass:

1. Prepare a strong soda or potash-lye solution by adding about a pound of lye to a pail of boiling water. Dip the metal or apply this solution with a brush, scrubbing well. Then rinse or wash with plain hot water and finally with cold water.
2. Buff metal, using felt wheel or muslin or cotton buffs. Wash with hot water and soap to remove all grease. Rinse with plain hot water and dry.
3. Polish with 3/0 or 4/0 steel wool.

Coloring Formulas

To produce an almost black finish on copper, use warm Liver of Sulphur (a few crystals dissolved in 1 pint of water). This solution is best applied if metal is warm.

Verde Green: Warm water, 1 qt.; copper nitrate, 1¼ oz.; chloride of lime, 1¼ oz.; ammonium chloride, 1¼ oz.

Blue Green: Warm water, 1 qt.; iron permitrate, 2 oz.; sodium thiosulphate, ¼ oz.

Green: 1 qt. water, ¼ lb. salt.

Red: Warm water, 1 qt.; salt, ½ oz.; copper sulphide, 1 oz.

Black: Water, 1 qt.; ammonium chloride, ½ lb.; potassium sulphide, ½ oz.

Brown: Water, 1 qt.; ammonium sulphide, ½ oz.

Rust Brown: Water, 1 qt.; barium sulphide, ½ oz.

At intervals the metal may be removed and if sufficient action hasn't taken place, then return it to the dip again.

Another method of coloring brass and copper is by heat. By means of heat we can get four distinct and attractive shades: red, straw yellow, purple, brown. These shades can be obtained by carefully watching. Combinations of these four colors make very attractive and different finishes.

How to Get Antique Finishes

Before coloring, it is essential that the metal be freed of oil that was used in the rolling operation. Due to the fine grain structure of the metal, oil or grease has been rolled into the pores and cleaning cannot be carried out too carefully.

Follow the cleaning directions given in the foregoing.

In handling the finished piece of copper or brass when in the acid, be sure to use only a pair of brass or copper tongs. This is necessary because iron or steel tongs would mark the work.

Natural Green: Copper, when exposed to the atmosphere will, after a time, develop green, due to natural phenomena. To quickly develop this very beautiful green patina that is so striking and permanent, use one of the following methods: (*a*) Use a solution of ½ lb. of salt dissolved in 2 gal. of water, or (*b*) Dissolve thoroughly 1 lb. powdered sal ammoniac in about 5 gal. of water. Let this stand for 24 hours. Apply either of these solutions to copper with a brush covering every part. Let this stand one day and then sprinkle surface with clean water.

If dark copper, or a brown tone is desired on copper exposed to the atmosphere, it may be obtained by rubbing the copper with cotton waste soaked in boiled linseed oil. This coating will gradually turn the copper a dark brown and will adhere to the copper surface for a long time. Tones developed on copper in the following order, brownish, reddish, bronze, bluish black, and black. Remove when desired tone is reached and wash thoroughly.

Antique Green Oxidized Effect: After cleaning use solution: hot water (160° F.), 3 qt.; muriatic acid, 1 qt.; verdigris powder, 3 lb.; copper carbonate, 8 oz.; sal ammoniac, 3 lb.

Apply lightly to copper and the atmosphere will deepen the green color.

To Blacken Aluminum: 1 oz. white arsenic; 1 oz. sulphate of iron; add to 12 oz. of hydrochloric acid. When the arsenic and iron are dissolved, add 12 oz. of water. Immerse article to be blackened in solution until sufficient depth of black is obtained. Rinse with water and dry with saw dust. Then lacquer.

To Copper Aluminum: Use same method as described for blackening aluminum. Dissolve 1 oz. sulphate of copper; 1 oz. cream of tartar; and ¾ oz. sodium carbonate in 32 oz. of water.

By using these formulas many beautiful effects may be obtained on the finished articles.

Finishes

The finish makes a success or failure of any article. The coloring of metal may be called one part of the finish; the adding of rivets for decoration is another part. In addition to either or both of those mentioned, the article must be polished in some way before it is finished.

A polish is obtained by using an abrasive to smooth the surface of the metal. Polishing may be done either by hand or machine. There are many compounds or abrasives from which to choose.

(Continued on page 23A)

MAKE YOUR *Electrical Instruction* MORE EFFECTIVE

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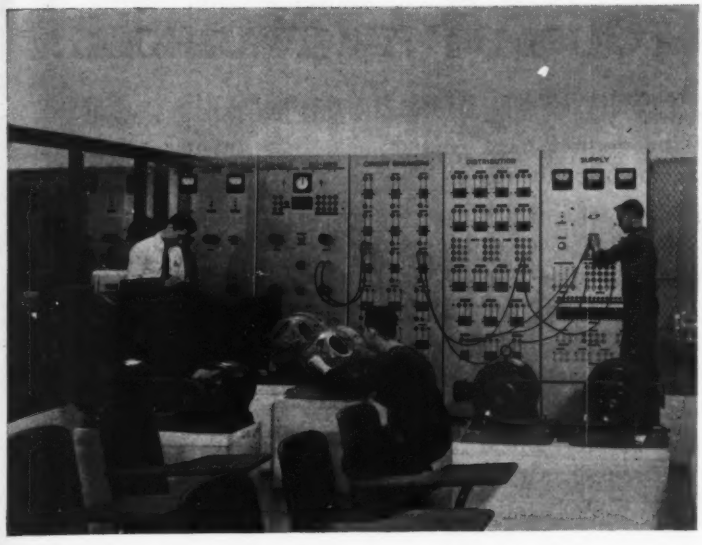
Test and Distribution Panels



The growing demand for well-trained men in industry makes *effective* training equipment imperative. *Standard* Test and Distribution Panels, in a wide range of types, and models, meet every instructional requirement from elementary electricity to adult work.

***Standard* Panels provide maximum circuit and operating flexibility, speed in connection changes. They are modernly designed, sturdily built, low in cost. Models available for all branches of electrical instruction—industrial arts shops, vocational and technical schools . . . Write Dept. W for Bulletin No. 109 giving full descriptions and typical installations.**

Engineering Services Available. **Our experienced field engineers bring you a broad experience backed by hundreds of installations. Their services are available in helping you develop a practical layout to meet your requirements.**

★ THE STANDARD ELECTRIC TIME CO. ★

Springfield, Mass. — Branch Offices In Principal Cities

(Continued from page 20A)

First clean the metal as already described.

If an electric motor is available, it may be equipped with an arbor for the buffing wheels. These should be charged with compounds for polishing. A small woodworking lathe with a three-step cone pulley also can be used for all types of wheels and buffs by attaching an extension to the live center and placing the buff on this.

There are several suggested speeds at which to run the different type wheels. The speeds given apply only in a general way, because school and homecraftsmen will make use of available equipment and lathes regardless of the speed at which they run: scratchbrushes[1] or bristle wheel brushes, 1250–1750 r.p.m.; walrus or felt wheels, 2000–2500 r.p.m.; muslin or cotton flannel buffs, 3000–4000 r.p.m.

The speeds given are the most desirable, but a 1750 r.p.m. and a 3-cone pulley can be used for obtaining the higher speeds.

The following compounds may be used on the buffs for obtaining the desired finish.

Crocus: A fast cutting red composition used for preliminary buffing on copper, brass, nickel silver, and the like.

Tripoli: This is most generally used. It is good for copper, brass, nickel, nickel silver, gold, silver, aluminum, and platinum. It is interesting to note that this abrasive can be used on the harder metals, such as copper and brass, and also on soft metals, such as silver and gold.

Rouge: This abrasive is most popular as a hand polish for jewelers. It may, however, also be used for machine polishing on brass, gold, and silver. It is obtainable in several grades. There is one grade which may be used for gold and silver, another for just silver, and a third for pewter.

Emery paste: This is a fast cutting abrasive to be used for preliminary work on copper, brass, and the like. It should always be followed with another type of polish.

Bobbing compound: This is the same as tripoli. It is quick cutting, and is preferred for wood, cup, or brush wheels.

Many companies manufacture special polishing cloths and stones, but the polishing compounds mentioned in the foregoing, are the standard ones used. There are several prepared liquids that also give excellent results.

Two popular hand finishes for copper, brass, and pewter are made from pumice and oil and pumice and water. Both these combinations are mixed to a pasty consistency and then the surface is lightly rubbed, using a piece of webbing or soft flannel cloth. With either of these methods a satin finish is obtained.

Pewter and aluminum come under the classification of soft metals. Softer metals must have a little different handling.

If a high finish is desired, use tripoli and a felt brush to remove all marks or scratches. Then follow with rouge and rag brush. Clean with soap and water, and polish with a soft cloth.

For a dull or satin finish, use pumice and oil as directed. Ancient pewter was kept clean by rubbing with brick dust, wood ashes, or sand.

When a high finish for pewter or aluminum is desired by machine, use a felt wheel and tripoli, and follow with a cotton buff and rouge. Extreme care must be used to avoid keeping the buff in one place too long, because the heat will melt the pewter at that point. For a scratchbrush finish use a steel or nickel-silver scratch and keep the wheel and work watered. Scratchbrushes may be used on any metal when a frosted finish is desired. A brass scratch brush used on white metal, such as pewter, will leave a yellow film. Bristle brushes will leave a bluish film, and steel brushes, a silvery finish.

These materials and methods are some of the more commonly used, and by experimenting with combinations of these, one can get special finishes of various kinds.

[1]Scratch brushes and buffs may be obtained from Wm. Dixon, Inc.

PERSONAL NEWS

RECEIVES A STATE APPOINTMENT

Some months ago, Dewey F. Barich, instructor in the industrial-arts department of Central State Teachers College, Mount Pleasant, Mich., was given leave of absence to assume the duties of assistant state supervisor of the National Defense Training Program for out-of-school rural youth in the state of Michigan.

Mr. Barich received his professional training at the Hibbing Junior College, Hibbing, Minn., The Stout Institute, Menomonie, Wis. (Bachelor of Science); and the University of Michigan (M.A. Education, Major Vocational Education). He has also taken work at the Michigan State College, and has had trade experience in the metal trades.

He was assistant instructor at Stout Institute, taught in the industrial-arts department of the Flint public schools, Flint, Mich.; was metal-

(Continued on page 24A)

WOULD YOU BUY A TIN CHISEL?

Of course you wouldn't. You know perfectly well it would be neither hard enough nor sharp enough to do any worthwhile cutting.

The same is true of ordinary sandpaper. You can't expect Flint Paper to last very long or do much work. *As an abrasive for wood sanding, flint is passé.*

In the woodworking industry, GARNET is today the most popular of all minerals. It is much harder and tougher, holding its sharper, chisel-like cutting edges infinitely longer.

Students of Mechanical Arts should experience for themselves the superiority of Garnet as a cutting tool over old-fashioned flint.

Specify GARNET—Behr-Manning Garnet

("Cabinet" Paper for wood in the white—
light pliable "Finishing" Paper for rubbing down finish coats)

Maximum CUT — Minimum COST — QUALITY ABRASIVES

BEHR-MANNING (DIVISION OF NORTON COMPANY) TROY, N.Y. and 15 Branches

Quality Sandpapers Since 1872

(Continued from previous page)

trades instructor in the Trenton public schools, Trenton, Mich., and then industrial-arts instructor in Central State Teachers College, Mount Pleasant, Mich., until he accepted his present appointment.

Dewey F. Barich

He is a member of the American Vocational Association, National Association of Industrial Teacher Trainers, Michigan Industrial Education Society, Michigan Education Association, Epsilon Pi Tau, and Phi Delta Kappa.

He has also made contributions to a number of professional periodicals.

RECEIVES DOCTOR'S DEGREE

John N. Willmott, supervisor of industrial and fine arts in the public schools of Garden City, N. Y., has been granted the Ph.D. degree by Columbia University. His dissertation, "High School Boys Electing Industrial Arts," is now in press and will be available about July 1 at the Bureau of Publications, Teachers College.

Mr. Willmott started his professional career in the State Teachers College, Fitchburg, Mass. He transferred from this institution to George Peabody College for Teachers, Nashville, Tenn., and received the B.S. degree in 1922 and M.A. in 1924. He taught industrial arts in the State Teachers College, Livingston, Ala., for five years,

John N. Willmott

spent a year abroad in study and travel and, after teaching industrial arts in the public schools of Rochester, N. Y., for one year, was appointed to his present position in Garden City in 1929. At the present time he is directing the visual education program in addition to his other duties.

During the summers of 1936, 1937, and 1938 he taught industrial-arts professional courses in the Graduate School of Education of Cornell University.

Mr. Willmott hold memberships in the following organizations and societies: American Vocational Association, National Educational Association, Visual Education Association, New York State Vocational Association, New York State Teachers Association, Long Island Industrial Arts Teachers Association, Nassau Schoolmen's Association, Phi Delta Kappa, Kappa Delta Pi, and Epsilon Pi Tau.

♦ J. E. MOORE, former instructor of the machine shop, and now director of the national defense training in the Coffeyville, Kans., schools, has been appointed supervisor of the newly combined industrial-arts and vocational education department.

♦ GERALD RORSCHACH has been appointed machine-shop instructor at the Roosevelt Junior High School, Coffeyville, Kans.

♦ RAYMOND E. ERICKSON, formerly instructor at the Woodrow Wilson Junior High School, Des Moines, Iowa, has been appointed to teach metalwork at the Technical High School, Dallas, Tex.

Mr. Erickson will also teach in the industrial-arts department at the Nebraska State Teachers College, Kearney, Neb., during the coming summer session.

♦ WILFORD G. FRISCHKNECHT, formerly State Youth Administrator for Utah, has been appointed regional director of the Pacific coast region, of the NYA. His office will be in San Francisco, Calif.

♦ GEORGE DALLY, who taught at the Boys' Technical High School, Milwaukee, Wis., for many years, died at the age of 49 at his home in Milwaukee on Monday, April, 6.

He was active in the Milwaukee Industrial Arts Teachers Association and in the Milwaukee Junior-Senior High School Teachers' Association.

While active professionally in local organizations, he nevertheless also found time to contribute to the professional magazines in his field.

He is survived by his wife and several children.

Train for DEFENSE and RECONSTRUCTION with Delta Low-Cost Machines

Both in the preparation for national defense — and in post-war readjustment — the role of Delta low-cost machines is vital! American Industry has been quick to see the many advantages of Delta machines — their low first cost, their low cost of operation and maintenance, their remarkable flexibility, adaptability and efficiency.

As a result of the amazing penetration of Delta Machines into industry — these same tools are now widely used in trade schools, "refresher" courses, school farm shops, special preparatory courses, N. Y. A. training — and many schools offering vocational training for National Defense. You can train students on Delta machines with the knowledge that their training will be of great value now — and LATER! Check into the complete story of Delta machines and see how they can aid in your vocational training program.

Batteries of Delta drill presses in operation at Eclipse Aviation, a Division of the Bendix Corporation.

Kearney & Trecker, Milwaukee, use 17" Delta drill presses for all their accurate drilling operations.

Many hundreds of school shops have installed Delta machines for industrial training.

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To aid in the more efficient operation and maintenance of Delta Machines—we have issued a series of operating manuals covering all major tools used in school woodworking shops.

This series includes books on "Circular Saw and Jointer", "Lathe" (including woodturning, metal turning and spinning), "Shaper", "Band Saw and Scroll Saw", "Drill Press" (for both wood and metal), "Abrasive Tools"—each of which list at 25c—and "Practical Finishing" which lists at 50c. All books are of uniform size, 6" x 9", paper covered and contain numerous illustrations and valuable information. Several universities and schools have considered the up-to-the-minute material in these operating manuals so comprehensive and authentic that they have requested, and been granted, permission for its use in part or whole in shop equipment text books.

GETTING THE MOST OUT OF YOUR BAND SAW and SCROLL SAW
GETTING THE MOST OUT OF YOUR ABRASIVE TOOLS
GETTING THE MOST OUT OF YOUR LATHE
GETTING THE MOST OUT OF YOUR SHAPER
GETTING THE MOST OUT OF YOUR CIRCULAR SAW AND JOINTER

SEND FOR SHOP LAYOUT BOOK

Prepared by vocational instructors from all over the country—the shop layouts and photographs contained in this new book are authentic school shop installations embodying the most ingenious solutions of the problems of space, safety, lighting, convenience and teaching efficiency in both small and large schools. There are actual floor plans and photographs of 30 shops in this attractive 44 page book.

In addition, this new book for the first time makes available important information on the new type of industrial power tools that are being so rapidly adopted for school use. Each tool is listed individually—and instructions for the placing and most efficient use of each tool are given.

Every one interested in vocational instruction should have a copy—and its yours —FREE.

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☐ I enclose $....., for which send me postpaid .....copies of following operating manuals.

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BUT GENTLE!

Stanley Soft Face Hammers are tough for hard use—"soft as velvet" for work on fine finished surfaces or delicate machine parts. They're just right for motor winding, machine and engine assembly and other jobs in automotive, aircraft and metal working shops.

Replaceable hammer tips of Stanley Soft Face Hammers are made of Stanloid, resilient plastic made to stand heavy use. Handles are "Evertite" processed hickory, wedged tight in heads' steel centers. Write today for Catalog 34 describing the full line of Stanley "Boy Proof" tools for use in school shops.

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Educational Dept., New Britain, Conn.

USE THESE 3 SOFT FACE HAMMERS FOR FORMING LIGHT SHEET METALS!

ASSOCIATION NEWS

THE MICHIGAN INDUSTRIAL EDUCATION SOCIETY CONVENTION IN GRAND RAPIDS

The Michigan Industrial Education Society's fourteenth annual convention was held in Grand Rapids, Mich., March 6, 7, and 8, 1941. This convention was a great success and was well attended.

It was the intention of the society to make Dr. Charles A. Prosser the honored guest of the convention, but, unfortunately, his sudden illness forced him to make a last-minute cancellation of the trip. The convention, as a whole, expressed regrets for his absence and wishes for his speedy recovery.

The convention theme was: "Vocational Education for National Defense."

Thursday, March 6, was set aside for a national defense conference of superintendents, administrators, directors and supervisors of this work. Men of national prominence in the field of industry, education, and labor were present at the conference in order to take part in the many meetings and to discuss and lay plans to carry out the purpose of the theme.

The first general meeting of the convention on Thursday evening, featured an address by H. J. Roesch, director of industrial relations of the Briggs Manufacturing Co., in Detroit. He gave detailed information of the types of training needed and explained how the schools and industry can co-ordinate their efforts in doing this work. His talk was one of the most helpful given during the convention and it was very well received.

The vocational education symposium which took place on Friday morning, under the chairmanship of George Fern, State Director of Vocational Education, discussed: "How to Integrate the National Defense Program." Some of the people taking part in this program were: Frank Dalton, state chief of trade and industry; H. M. Taliaferro, president of the American Seating Co., Grand Rapids; Robert Waldron, director of public relations, Hudson Motor Car Co., Detroit; Edward Kosten, co-ordinator in Grand Rapids, representing the American Federation of Labor; Leonard Woodcock, International Representative of the United Automobile Workers, CIO; Earl Bedell, director of industrial education, Detroit; Sam H. Hill, district director of Civilian Conservation Corps, and others.

The three division meetings — Industrial Arts, Trade and Industry, and Womens' Trade and Industry, met Friday afternoon. All of these meetings were of a high caliber, and the people taking part were equal to lead off speakers for a convention. Those who attended the division meetings were very enthusiastic in their praise of them.

One of the high lights of the convention was the Friday evening banquet and general meeting at which T. A. Boyd, department head of the Research Laboratories of General Motors Corp., gave an excellent, illustrated address on, "The Skilled Worker in the Evolution of Motor Transport." The special entertainment given by the Grand Rapids public schools was outstanding, and the dance, which followed, was declared the "best ever."

Two members of the society, E. Lewis Hayes and Arthur L. Reagh, were given special honors by the society for distinguished service in industrial education. They were both granted a "Honorable Life Membership" in the society. Seventeen demonstration and topic groups met on Saturday morning for discussion on all subjects from adult education and part-time to industrial-arts design. All of these groups reported interesting and well worth-while discussions.

The Michigan Industrial Education Society's town meeting was another high light of the convention and the very prominent and interesting participants were: chairman, Warren E. Bow, first assistant superintendent, Detroit public schools; M. A. Clark, manager, Industrial and Public Relations, U. S. Rubber Co., Detroit; Frank Martel, president, Detroit and Wayne County Federation of Labor; Chester Miller, superintendent of schools, Saginaw; and Victor Reuther, Congress of Industrial Organization. This group discussed, "Influence and Implication of Vocational Education for National Defense Upon School Curricula." The interest in this meeting was so intense that there was an overflow of attendance and it was difficult to terminate the discussion in time to start the annual business meeting.

The final meeting of the convention was the Ship's Luncheon on Saturday noon. This was a very large and enthusiastic group which enjoyed the address by Murray D. Van Wagoner, Governor of Michigan. The address was broadcast over the Michigan network. The Ship's Program was as popular as ever, and the presiding Ship's Officer, John Claude, did a good job of keeping everyone in a good humor while waiting for the distribution of the prizes.

The commercial and educational exhibits were larger and better than ever before. Some outstanding educational exhibits were shown by the defense training classes and the WPA. The school exhibits were exceptionally fine and an interesting feature was the high quality of design and workmanship shown by the smaller communities. The Grand Rapids Industrial Arts Department held a fine exhibit in the new public museum. This was one of the points of interest in the tours.

The new officers of the society, as announced by the election officials, are: president, Carl E. Karlstrom, supervisor of vocational education, Detroit; vice-president, George F. DePuy, head of department, Central State Teachers College, Mt. Pleasant; secretary-treasurer, Arthur L. Reagh, supervisor of industrial arts, Grand Rapids. — *Arthur L. Reagh.*

(Continued on page 28A)

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TRAIN FOR DEFENSE WITH *MICRO*-SPEED!

Reg. U. S. Pat. Off.

SIMMONS Micro-Speed turret screw machines, lathes and millers are the ideal tools for vocational training purposes. They are offered with three distinct advantages:

- **Low Cost**
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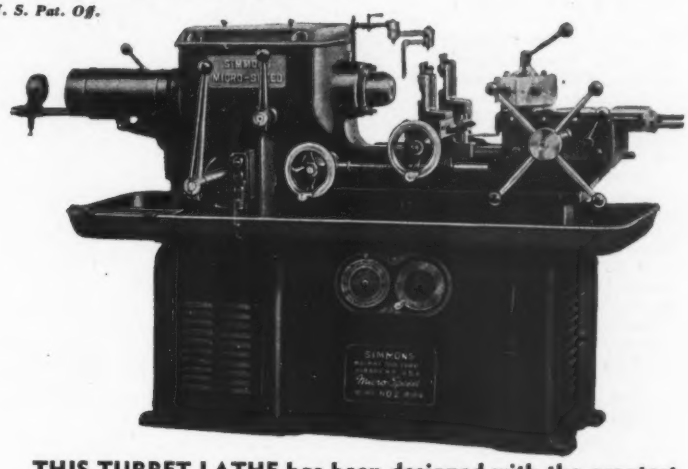
The Micro-Speed Drive is a patented device providing variable-speed output using constant-speed AC Motors.

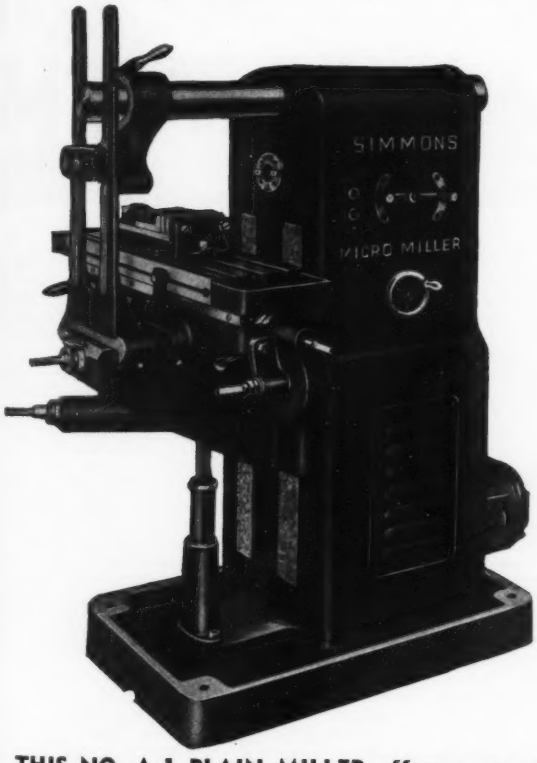
Write Today for Descriptive Bulletins containing complete details on all tools illustrated.



THIS TURRET LATHE has been designed with the greatest simplicity. Production tooling equipment adaptable to other standard turret lathes of similar size is also applicable to the Simmons machine.

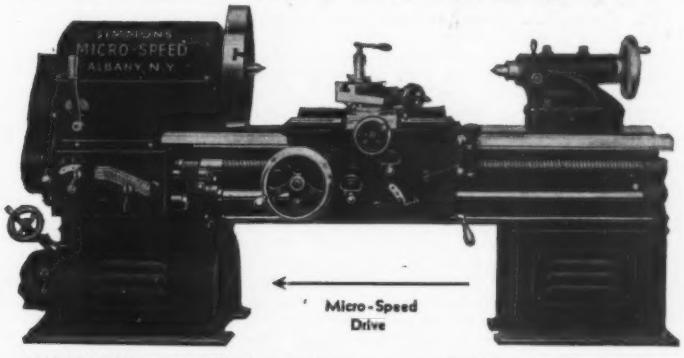
THE SIMMONS MICRO-SPEED DRIVE, equipped with push-button control and spindle brake, offers a range of spindle speeds up to 1,500 RPM by a mere turn of a handwheel.

New cabinet base. Spindles mounted on Timken Precision Tapered Roller Bearings. Levers within immediate reach of operators. Head cast solid with bed, insuring rigidity.



THIS NO. A-1 PLAIN MILLER offers a range of spindle speeds from 38 to 500 RPM at the turn of a handwheel conveniently placed on the column, inside of which is mounted the MICRO-SPEED DRIVE.

Range of Feeds: **Longitudinal, 34"; cross, 8"; vertical, 18"; work surface of table, 27" x 8".**



SIMMONS LATHES provide more spindle speed changes than it is possible to obtain in any geared-head lathe now manufactured. Any speed between the high and low limit is obtainable by operating a handwheel conveniently placed on the front of the machine.

In all other respects, the Simmons Lathes are of conventional design and include Timken Precision Tapered Roller Bearings, snap levers for apron feeds and added efficiency under heavy loads.

Simmons Lathes are manufactured in 16" and 18" standard; 18" and 20" heavy (illustrated above) and in a wide variety of gap bed sizes in all bed lengths.

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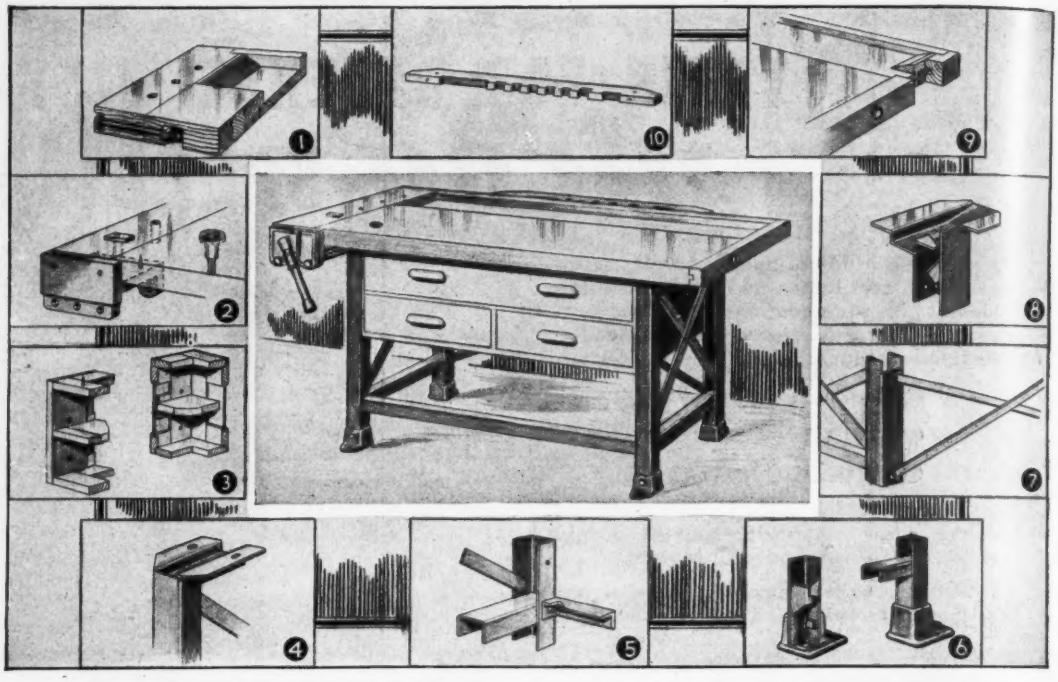

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HAMILTON
Laboratory and Vocational Furniture

(Continued from page 26A)

♦ On the afternoon and evening of March 15, 1941, the twelfth annual regional initiation and banquet of Epsilon Pi Tau, the honorary professional fraternity for industrial arts and industrial vocational education, was held at Miami University, Oxford, Ohio.

Alpha Chapter at Ohio State University, Beta Chapter at Ball State Teachers College, Gamma Chapter at Miami University, and Lambda Chapter at Ohio University joined in the exercises. More than 150 members and guests from Southern Ohio, Southeastern Indiana, and Western West Virginia were present. Individual members from Iowa and other states also attended.

At the initiation held in the afternoon 30 men from the four chapters were initiated. In addition to graduate and undergraduate students of the several universities, prominent alumni were among the men initiated into the fraternity. The initiation team was composed of Prof. O. E. Sink of Ball State Teachers College, the national president of the fraternity, Dr. W. E. Warner, Ohio State University, executive secretary; Elmer W. Christy, director of industrial arts in the public schools, Cincinnati, Ohio; Prof. Robert M. Keck, State Teachers College, California, Pa.; Prof. James O. Stephan, Ohio University; Prof. Harold G. Palmer, State Teachers College, Cedar Falls, Iowa; Prof. A. A. Grinnell, Miami University; E. J. Robinson, director of industrial arts in the public schools, Dayton, Ohio; and Percy E. Grooms, president of Gamma Chapter, Miami University.

At the banquet held in the evening, Walter Shockey, former president of Gamma chapter and now teacher in the Fairfield School, Butler County, Ohio, was toastmaster. An address of welcome was given by Dr. A. H. Upham, president of Miami University. The guests, including college presidents, deans, school superintendent, and others, were introduced by Dr. F. C. Whitcomb, director of the division of practical arts, Miami University.

Dr. E. J. Ashbaugh, dean of the School of Education of Miami University, spoke on what is expected of the teacher of industrial education, and Dr. C. V. Courter, superintendent of schools, Cincinnati, Ohio, addressed the group on what the pupil expects of the industrial-education teacher. The initiates were introduced and charged by Prof. O. E. Sink, national president of the fraternity. Dr. W. E. Warner, national executive secretary, reported on the development of the fraternity. He stated that during the 12 years of its life, it had grown to a membership of 1800 in 41 states, five territories, and two foreign countries.

After the adjournment to the auditorium in the building, the main speaker of the evening, George H. Leland, was introduced by E. J. Robinson, director of industrial arts in the public schools of Dayton. Mr. Leland, who is chairman of the board of directors of the Leland Electric Co., and who has done notable research work, delivered an address on "Polarized Light and Its Applications."

♦ The 1941 Pennsylvania Industrial Arts Conference will be held on the Millersville campus, on Saturday, April 26.

Sound and silent motion pictures on vocational guidance, handicraft processes, and the manufacture of coated abrasives will be shown from 9 to 11 a.m.

The general session, which will be held at 11 a.m., will be presided over by Urwin Rowntree, chief, Bureau of Industrial Education, Pennsylvania State Department of Public Instruction. The main address on "American Handicrafts" will be given by Allen Eaton, survey agent of the Russell Sage Foundation.

The toastmaster at the 12:30 luncheon will be William Caswell, industrial-arts supervisor, State Teachers College, Mansfield, Pa.

Elroy Bollinger, supervisor industrial teacher education, of New York City, will discuss "Problems of Industrial Arts Teaching," on this occasion.

The Iota Chapter of the Iota Lambda Sigma Fraternity will hold a banquet at 6 p.m., at which formal initiation ceremonies will be held, admitting five new members. At this banquet, Elroy Bollinger will be initiated as an honorary member of the fraternity.

♦ The annual spring conference of the Connecticut Industrial Arts Association was held at the Teachers College of Connecticut on Friday and Saturday, March 14 and 15. As usual the most colorful part of the conference was the Friday evening banquet program. Dr. Alonzo G. Grace, State Commissioner of Education, spoke on "National Defense and the Industrial Arts Program." He was followed by Dr. Herbert D. Welte, president of the Teachers College of Connecticut, who talked on "An Experimental Elementary Program at the Teachers College." Prof. R. Lee Hornbake, guest speaker from Oswego State Normal School then addressed the association on the topic "Industrial Arts in Elementary Education."

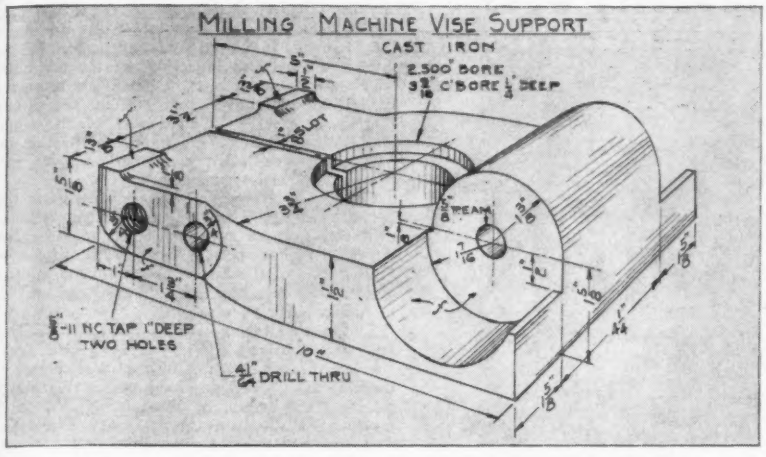
The Saturday program was composed of addresses by Dr. Homer J. Smith of the University of Minnesota on "Broadening Industrial Arts Responsibilities," and "A Program for Industrial Education"; by Prof. R. Lee Hornbake on "Industrial Arts in the Secondary Program"; and by L. P. Arduser, of the International Textbook Co., on "Some Needed Publications." The Association was presented with a Certificate of Affiliation by the American Industrial Arts Association.

At the Friday banquet John A. Backus, Manager of the Department of Education of the American Type Founders Sales Corporation, Elizabeth, N. J., presented a motorized American flag to the Connecticut Industrial Arts Association.

Officers elected for the next two-year period are as follows: president, G. Wesley Ketcham, Norwalk High School; vice-presidents, James Ginns, supervisor of industrial arts in New Britain,

(Continued on page 31A)

DEFENSE PROBLEM NO. 3



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School Bureau, JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J.

(Continued from page 28A)

Joseph Adams, Hillhouse High School in New Haven, and Lawrence Houle, Prospect School in Bridgeport; secretary, Anthony Marinaccio, Barnard Junior High School in Hartford; and treasurer, Donald J. Tracy, Bedford Junior High School in Westport.

♦ The Nebraska Industrial Arts Teachers Association met March 28 and 29 in Lincoln, under the leadership of president L. G. Lindahl, head, department of industrial arts, Chadron State Teachers College, Chadron.

Dr. Homer J. Smith, professor of industrial education, University of Minnesota, was the main speaker. He gave three fine addresses: "A Guidance Counselor's Philosophy," "What Shall We Say for the Youth of Today," and "Reactions to Current Trends."

Carl J. Orness, auto-mechanics instructor, Lincoln High School, gave a demonstration on "Making Slides and Film Strips." His presentation pointed out many possibilities in the field of visual education.

A tour was conducted through the Lincoln Air School, headed by Mr. Orness. Seventy-two industrial-arts teachers were present at the drawing for prizes after the noon luncheon.

The officers elected for the year of 1941 are: president, Otto C. Olson, head, department of industrial arts, Nebraska State Teachers College, Kearney, Neb.; vice-president, H. H. Newman, trades and industries co-ordinator, high school, North Platte, Neb.; secretary-treasurer, Glenn O. Trogdon, general shop instructor, Gering High School, Gering, Neb.

♦ The regular March meeting of the Fairfield County Industrial Arts Association was held on Wednesday evening, March 12, at the Roger Sherman School in Fairfield, Conn. A demonstration and lecture by G. E. Baldwin of Pleasantville, N. Y., on the use of plastics with hand- and power-tool operations was well received. Reports were made of the meetings of the American Industrial Arts Association in Atlantic City and of the progress being made in Connecticut and New England Industrial Arts Associations. The nominating committee renominated the present officers for the next year. The official certificate of affiliation with the American Industrial Arts Association was shown the group by the president. The final meeting of the year will be held in the Bethel High School, Bethel, Conn., at which time Raymond W. Phipps, state supervisor of arts and industries will be the main speaker. — *Benjamin Isenberg.*

♦ At the regular monthly meeting of the Brooklyn, N. Y., Guild Teachers of Shopwork on February 13 at the Hotel Granada, James E. McGinley, New York State representative of the Bruce Publishing Company, spoke on "Industrial Arts Textbooks in the School Shop."

Rudolph Schumacker, Jr., a master metal-craftsman and designer, gave a demonstration and exhibition of his work.

The next meeting will be held in the studio of the William Dixon School of Metal Crafts, New York City.

The 1941 officers of the Brooklyn Guild are: Alfred Wieda, president; Charles C. Fischer, vice-president; Stanley Weber, treasurer; John M. Hurley, financial secretary; and Harry Flaster, corresponding secretary.

♦ The February meeting of the Massachusetts Industrial Arts Society was held at the Hotel Continental in Cambridge on February 28.

After a short business meeting, the Society voted to become affiliated with the American Industrial Arts Society, allied with the N. E. A.

Dan Sullivan, president of the Society, introduced the speaker of the evening, Dr. Elbridge C. Grover, superintendent of schools in Reading. An interesting question period followed, after which the meeting adjourned. — *Otis W. Leary.*

♦ Mu Sigma Pi Industrial Arts Fraternity of Wayne University, Detroit, Mich., held a farewell dinner several weeks ago, in honor of Dr. Verne R. Fryklund, who has left Wayne University to return to the University of Minnesota. The Mathetes, junior members of Mu Sigma Pi, presented Dr. Fryklund with a life membership to their organization, while the fraternity expressed its appreciation for his fine work with a beautiful set of bronze book ends.

One hundred and fifty teachers were present including Dr. David D. Henry, president, and Dr. Waldo Lessenger, dean of the College of Education, Wayne University.

♦ The annual election of officers of Mu Sigma Pi Industrial Arts Fraternity was held on January 18 at the Stockholm Restaurant in Detroit. Officers elected for the ensuing year are as follows: president, G. Harold Silvius; vice-president, Ernest G. Gardner; recording secretary, Frank C. Gordon; corresponding secretary, A. G. Whitney; treasurer, Frank Updegraf; and executive board, Cecil Zwickey. — *Fred Schelter.*

♦ The twenty-first Annual Conference of the Southern West Virginia Industrial Arts Association will be held at New River State College, Montgomery, W. Va., Saturday, April 26.

The main speaker at the convention will be Prof. Marshall Byrn of the University of Michigan, Ann Arbor, Mich. In the afternoon, Mr. Byrn will give a demonstration of metal spinning.

♦ The sixth annual Wisconsin Association of Vocational and Adult Education will be held at Milwaukee, Wis., May 1 to 3. Hotel Schroeder will be the headquarters for convention visitors and all general meetings as well as the banquet, and some of the luncheons will be held there.

The commercial exhibits will cover a wide range. Their educational value stands unquestioned.

With the intense interest and activity now observable on the question of vocational training for defense workers, the convention promises to be exceedingly instructive and enlightening for all who attend.

♦ The Missouri Annual Spring Conference for teachers of industrial and distributive education will be held May 9 and 10, at the University of Missouri, Columbia, Mo.

The conference is sponsored jointly by the state department of education and the university.

(Continued on next page)

Vocational School Students Like the Wash Fixtures that All Industry Uses

Portion of Washroom, South Vocational School, Pittsburgh, showing three of eight Bradley Washfountains.

Group wash fixtures — Bradley Washfountains — provide clean running water to each of the 8 to 10 students simultaneously, — for a quick wash-up.

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BRADLEY WASHFOUNTAINS

(Continued from previous page)

Among the speakers will be Thomas Diamond, professor of industrial education at the University of Michigan; Dean W. H. Stead of Washington University, St. Louis, Mo.; Arthur B. Wrigley, state supervisor of industrial education, Trenton, N. J.; Prof. Robert W. Selvidge of the University of Missouri, and Lloyd W. King, state director of vocational education, Jefferson City, Mo. — *H. H. London.*

♦ The Wisconsin Vocational Guidance Association will convene at Eau Claire on May 17 to consider with teachers and administrators of central and northern Wisconsin the timely question of "The Role of the Teacher in Guidance Services." A seven-member panel will present current problems in the morning general meeting. Sectional meetings built around small group interests will be provided for the afternoon. A résumé of the southern Wisconsin state convention will be given.

♦ The Eighth Conference on Business Education will be held June 26 and 27, in conjunction with the fiftieth anniversary celebration at the University of Chicago.

The theme for this convention is, "The New Economic Education."

The speakers chosen are: Stephen M. Corey, professor of educational psychology, superintendent, Laboratory Schools, University of Chicago; Ernest O. Melby, dean of the school of education, Northwestern University, Evanston, Ill.; Hazel Kirk, associate professor of home economics and economics, University of Chicago; Ruth E. Eckert, School of Education, University of Minnesota, Minneapolis, Minn.; R. S. Hadsell, Consumers' Counsel Division, U. S. Department of Agriculture, Washington, D. C.; Theodore Coover, Central High School, Tulsa, Okla.; and James Mendanhall, Institute for Consumer Education, Stephens College, Columbia, Mo.

The subjects that will be discussed are: "Possibilities and Limitations of the New Economic Education"; "Obligations of the Public School in Economic Education"; "Unbiased Economics in the Public Schools"; "The Individual in His Immediate Economic Relationships"; "The New Economic Education and Individual Adjustment"; "Materials for the New Economic Education: The Senior High School"; and "Materials for the New Economic Education: The Junior College."

♦ The regular monthly meeting of the New York School Crafts Club was held in the Hotel Imperial, New York City, February 15, 1941.

John J. Hatch of Newark, N. J., a past president of the club, gave an interesting address on the American Industrial Arts Association. He outlined the aims and objectives of the association which was founded in 1939. There are more than 25,000 industrial-arts teachers in the United States; they serve in all grades of the schools and colleges, and play an important part in preparing the youth for living in an ever more complex industrial democracy.

Charles G. Fischer, a teacher in Junior High School No. 210, Brooklyn, gave a talk and demonstration on projects which may be completed in a short period of time. Mr. Fischer exhibited a varied display of completed projects, and many novelties were introduced in tool manipulations and processes.

The next meeting will be held in the Hotel Imperial, April 19, 1941. — *Allan S. MacGregor.*

♦ The March meeting of the Westchester Industrial Arts Club was held at the Washington Junior High School of Yonkers, N. Y., on the evening of Friday the twenty-eighth. Oliver Kendall was the host of the evening.

After the usual shop visitation period the members present listened to Daniel F. Hodgon, an expert on school law from Hofstra College, Hempstead, Long Island, who delivered a very interesting and informative talk on the subject: "The Legal Aspects of Teachers Salaries, Tenure, and Retirement." After his talk Dr. Hodgon answered many questions put to him by the men present.

Emerson W. Manzer, chairman, announced that his committee had completed most of the many necessary arrangements for the "Manufacturer's Night" which is to be held between 7:30 and 11:30 p.m. at the Bronxville high school on Friday, April 25. About 30 firms dealing with industrial-arts supplies, machinery, and equipment are to exhibit and demonstrate their wares on this occasion. Mr. Manzer introduced Mr. Schulte of Bronxville, who for the past 40 years has been recognized as an art-metal craftsman, and promised the shopmen that Mr. Schulte had agreed to demonstrate his art for them on the evening of April 25. The Long Island Industrial Arts Club, the Orange County Industrial Arts Club, and the Fairfield (Conn.) Industrial Arts Club have been invited to attend the "Manufacturer's Night."

The banquet committee announced that May 25 is the tentative date set aside for the Annual Banquet of the club.

The nominating committee presented, and the club elected the following slate of officers for next year: president, Herbert F. Lidstrom of Rye Neck; vice-president, Norman Ferguson of Tarrytown; secretary, Oliver Kendall of Yonkers; treasurer, Roland Hintz of New Rochelle.

NEW PUBLICATIONS

Machine Shop Training Course

By Franklin D. Jones. Cloth, illustrated, 6¼ by 9¼. Volume I, 474 pages, price, $4. Volume II, 552 pages, price, $4. Combination price, $6. Published by The Industrial Press, 148 Lafayette St., New York City.

These two volumes form an excellent treatise on machine-shop practice, covering as they do both elementary and advanced work. The books are well illustrated and clearly printed. The sideheads, throughout the books, are set in question form. These questions are then followed by explanatory matter which answers the question.

The first volume describes the work done on the various types of lathes, and on vertical boring and turning machines. Cutting speeds and feeds, cutting fluids, screw cutting, drilling and reaming, accuracy in interchangeable manufacture, fits, and precision measuring are all covered.

Volume II takes up the milling machine, and clearly explains how to make the calculations for dividing head and helical cutting jobs. The cut-

(Continued on page 37A)

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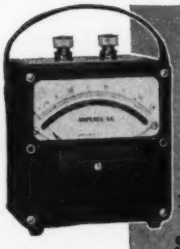

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One of many WESTON multi-purpose instruments for limited budgets; or for radio training. The Model 772 has 24 voltage, current, resistance and decibel ranges in one instrument. Has large, dependable WESTON 50 microampere meter. AC sensitivity 20,000 ohms per volt. Ohmmeter entirely battery operated. Broad measurements, and low cost, make it ideal for all preliminary checking . . . as well as for radio instruction.

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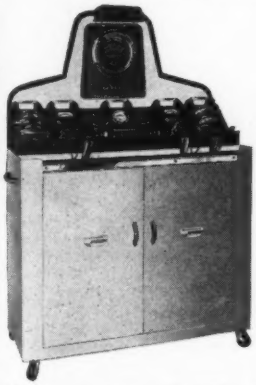
The Weidenhoff Model 1017 Analyzer makes available to the school shop modern precision instruments that aid to diagnose all varieties of engine troubles on the latest models of automobiles, trucks, and tractors.



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A feature of especial interest is removable unit construction. Enables more than one operator to use the equipment at the same time. Full details pertaining to range of tests possible with the various pieces of equipment making up Model 1017 Engine Analyzer available upon request.

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SHOP EQUIPMENT NEWS
New Products—Publications

TOOLROOM PRECISION LATHE

The new Model A 9-in. swing toolroom precision lathe recently announced by the South Bend Lathe Works, South Bend, Ind., is well adapted for small diameter work requiring a high degree of accuracy and sensitivity. This lathe has a maximum collet capacity of ½ in., maximum swing over bed ways of 9⅛ in., and a maximum swing over saddle cross slide of 5½ in. Three bed lengths are available, providing center distances of 16, 22, and 28 in. respectively.

Twelve spindle speeds ranging from 41 to 1270 r.p.m. are provided on the motor-drive models. A wrenchless bull-gear lock permits engaging the back gears quickly when slow speeds are required for machining large diameters.

A series of 48 power longitudinal feeds, 48 power cross feeds and 48 pitches of screw threads, right or left hand, are provided by the quick-change gear mechanism. The full automatic apron is equipped with a powerful worm drive and friction clutch for operating both the automatic power cross feeds and the automatic power longitudinal feeds.

Equipment supplied with this lathe includes the hand wheel type drawn-in collet chuck, collet rack, taper attachment, thread dial indicator, micrometer carriage stop, and chip pan. Other attachments supplied to order include an electric grinding attachment, milling attachment, oil pump and piping, chucks and accessories.

This new toolroom lathe is made in floor type with pedestal motor drive, as illustrated, also in bench type with motor drive, and in both bench and floor types with countershaft drive. All models are illustrated and described in Catalog No. 50–B, a copy of which may be had on request.

EISLER A.C. TRANSFORMER TYPE ARC WELDER

The Eisler Engineering Co. of 740–770 South 13th St., Newark, N. J., has recently placed a new model a.c. transformer type arc welder on the market. This machine is available from 100- to 400-ampere capacity. They are made standard to operate on 220 volts, 60 cycles, a.c., single phase, or any single phase of a polyphase circuit, and can be supplied for 440 or 550 volts at no extra cost.

A few of the features of this arc welder are: ease of striking and holding an arc due to a specially designed series reactor that is used in all Eisler arc welders. The current is controlled by means of a conveniently located knob which regulates the voltage automatically. The value of current and size of welding rod to be used is clearly indicated for each dial setting. Non-inflammable and heatproof insulation (Fiber glass and Mica) is used throughout the machine, insuring trouble-free operation indefinitely. There are no rotating parts in the machine and therefore very little maintenance is required. The welders are mounted on rubber-covered swivel casters for moving easily from job to job.

These arc welders are also available mounted on two smooth rolling wheels that are specially designed for rough and outdoor roads. Standard equipment is available with any of these welders.

A LIGHTWEIGHT MOBILE AMPLIFIER

Weighing only 20 lb., this Thordarson 12-watt mobile amplifier, which operates from a 6-volt storage battery, answers many portable public-address problems. It measures only 13½ by 7½ by 7¼ in.—a compact unit to carry. The unusual quality and high efficiency of this amplifier makes it ideal for use on military drilling fields, athletic fields, and parade grounds. Designed for use in police cars, fire-fighting equipment, and sound trucks where a dependable emergency and continuous duty unit is required.

Several output impedances are available by adjusting a simple rotary-switch selector. A stand-by switch is provided which allows operation the instant the switch is turned on without waiting for the tubes to heat up. Extra heavy battery cables are supplied with clips for easy connection to the battery. The unit may be used with either a 6-volt or spring-wound phonomotor and turntable for record reproduction.

Those interested are cordially invited to write to the Thordarson Electric Mfg. Co., 500 W. Huron St., Chicago, Ill., for complete technical information regarding this and other fine Thordarson amplifiers and sound-distribution equipment.

PORTABLE SPRAY PAINTING OUTFITS

The De Vilbiss Co., Toledo, Ohio, has developed a series of small portable spray painting outfits which combine efficiency, modern streamline design, and trouble-free operation.

These De Vilbiss outfits, known as NCB, lend themselves well to shops on the industrial-arts and vocational-education level.

The series consists of five different spray equipment assemblies, all built around a radically new and different ¼ horsepower electric motor-driven air-compressing unit. Three are cup-gun outfits and two include a pressure-feed paint tank of 2 gal. capacity.

The air-compressing unit is composed of a ball-bearing, piston-type compressor, connected direct to a standard ¼ horsepower motor. These, together with the crankcase and pulsation chamber, form an integral unit which is enclosed in a streamlined housing.

They are built to deliver 2.6 cu. ft. of air per minute at 40 pounds pressure, and will handle both light- and heavy-bodied spray materials of all types for finishing woods, metals, or ceramics.

Sturdily constructed, they will perform consistently without breakdown or repair. They are compact and light in weight.

Further information concerning the NCB spray painting outfits may be had by writing to the De Vilbiss Co., 300 Phillips Ave., Toledo, Ohio.

ATLAS BLUEPRINT CHARTS

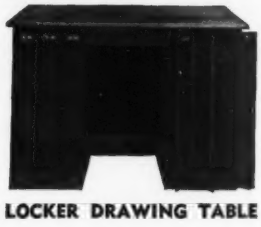
Industrial-arts instructors are being aided by a series of blueprint charts on lathe practice released recently by Atlas Press Co., Kalamazoo, Mich. The three charts now available are: "Lathe Cutting Tools," "Thread Forms and Formula," and "60° V-Type Thread Dimensions." Each chart has been prepared at the suggestion of prominent industrial-arts instructors and presents reference information useful to advanced students as well as to the beginners. The charts measure 16¼ by 21 in. and are printed on durable ledger paper.

The three Atlas lathe charts are being offered for a limited time to industrial-arts instructors. When requesting the charts, enclose 10 cents in stamps to cover handling and mailing expense. Or the set will be sent free postpaid with each order for the Atlas "Manual of Lathe Operation," a 272-page instruction book covering every phase of modern lathe work (special instructor's price, 75 cents). Address Technical Service, Atlas Press Co., Kalamazoo, Mich.

VALUABLE INFORMATION

A new booklet-catalog, entitled "Lyon Steel Equipment for Vocational Schools," is available free to vocational training departments and schools. It is designed to help solve problems relating to (1) training methods, (2) protecting tools and materials, (3) increasing classroom and shop capacity, (4) storing supplies and personal effects, (5) increasing student efficiency and understanding of industrial shop methods, and (6) reducing fire hazard.

LOCKER WORK BENCH



LOCKER DRAWING TABLE

In this booklet are shown the types of shop and tool storage equipment found in the most modern industrial plants. It is equally well adapted for educational purposes, and vocational schools and departments faced with the necessity of stepping up their programs under national defense training plans, and readapting their shop and toolroom equipment to take care of increased registrations, will do well to study it carefully.

The booklet is available to teachers and school officials by writing on school stationery to Lyon Metal Products, General Offices, Aurora, Ill.

NEW DRAFTING PAMPHLET

A new pamphlet entitled "Drafting Standards Accepted and Proposed" has just been issued by Chas. M. Higgins and Co., Inc., 271 Ninth St., Brooklyn, N. Y.

This pamphlet contains the standards of the American Standards Association as applied to mechanical drawing and the standards of the American Welding Society. There is also a page devoted to the proposed standards for mechanical drawing which have not yet been accepted.

This handy compilation of drafting-room standards may be obtained free by instructors of mechanical drawing, and by the heads of drafting departments in industry.

Where it is to be adopted for students' use in the classroom, the cost of the pamphlets has been set at 25 cents.

INSTRUCTION SHEETS FOR HANDEE ARTIZAN

The Chicago Wheel and Mfg. Co., 1101 W. Monroe St., Chicago, Ill., is issuing a series of instruction sheets which contain much valuable

(Continued on page 37A)

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BOICE-CRANE'S MODERN MACHINES
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Shop Tested POWER TOOLS
SAFETY-ENGINEERED FOR SCHOOLS

(Continued from page 34A)

information as to the care and use of the Handee Artizan, the materials to be used for making different metal projects, how to shape metal with and without forms, and when and where to use various types of accessories that are obtainable for the Handee Artizan.

There are also a number of instruction sheets on how to make various types of trays, among which are rectangular shaped, round, leaf and blossom type, and odd-shaped trays.

Other projects are: portable wood box in brass, desk-pad corners, pewter sugar and creamers, door knockers, wrought-iron lamps, bud vases, and flowerpot brackets.

AN INSTRUCTIVE FILM

Industrial-arts and craft groups are offered the free use of a motion picture illustrating an actual woodworking project, called "And So We Make an Extension Table." The film is presented by Albert Constantine and Son, Inc., New York, in cooperation with The Bruce Publishing Company, Milwaukee.

The movie is a nonadvertising, 1100-foot silent 16mm. film, three reels with a showing time of 40 minutes, graphically illustrating the proper method of hand and machine operations encountered in the making of an extension table.

The film was produced under the direction of Herman Hjorth of the Saunders Trades School, in Yonkers, N. Y. Mr. Hjorth is an outstanding authority on the subject of woodworking and is author of the books: *Forty Pieces of Fine Furniture, Principles of Woodworking, Reproduction of Antique Furniture, Machine Woodworking,* and *Basic Woodworking Processes.*

The project of making an extension table was selected because of the different woodworking problems which are encountered in construction of such a piece of furniture.

For further information write to Albert Constantine and Son, Inc., 797 East 135th St., New York City.

NEW PUBLICATIONS

(Continued from page 32A)

ting of the various forms of gears are also described.

Surface, inside and outside cylindrical grinding, lapping, broaching, and heat treatment of steel are all given attention.

An interesting section of 48 pages on definitions of shop terms has been made a part of this book.

Materials of Industry

By Samuel F. Mersereau. Cloth, xxiv–578 pages. McGraw-Hill Book Company, New York, N. Y.

Teachers of industrial arts and of vocational subjects have found increasingly a need for acquainting boys with the nature, sources, and preparation of materials used immediately in the school shops and in the trades for which students are preparing. The present book touches upon essential characteristics and manufacturing processes only, and is intended quite as much to suggest further study as to provide a large amount of information. The five chapters take up (1) forest products and articles produced with their aid, (2) nonmetallic minerals and their by-products, (3) iron and steel, (4) nonferrous metals, and (5) a variety of common products made from rubber, plastics, paints, and finishing materials.

Foundry Work

By William C. Stimpson and Burton L. Gray. Revised by John Grennan. Cloth, 216 pages, 5¾ by 8½, illustrated. Published by the American Technical Society, Chicago, Ill.

The revised text on foundry work contains material on both the practical and the theoretical aspects of this phase of the metal trades.

It is divided into two parts, the first of which is devoted to the subject of molding practice, while the second pertains to casting operations.

Besides illustrating and explaining the various foundry processes, it also contains descriptions of the hand and power machinery, and the equipment used by those who follow the foundryman's trade.

The book also contains considerable material on the various metals and alloys.

Advanced Machine Work

By Robert H. Smith. Cloth, 75 pages, 5⅜ by 8⅛, illustrated. Price, $3.25. Published by Industrial Education Book Co., Boston, Mass.

This is the twelfth edition of this well-known book designed for use in the machine shops in technical high and trade schools, and for the training of apprentice machinists.

The material in the book is divided into 16 sections, six of which are devoted to lathe work and lathe operations; two to grinding; and one each to planing, milling, gear cutting, mechanical measurements, and tungsten carbide cutting tools, and toolmaking; and two to inspection.

Seat Weaving

By L. Day Perry. Paper, 94 pages, 5¼ by 7⅝, illustrated. Price, 90 cents. Published by the Manual Arts Press, Peoria, Ill.

This is the third edition of this helpful little book. Two new projects have been added, and several new line drawings have been substituted for some of the older illustrations. These will clarify the directions given for carrying out the various weaving processes.

General Accounting

By H. A. Finney. Cloth, viii–604 pages. Price, $5.35. Published by Prentice-Hall, Inc., New York, N. Y.

This book is written from the consumers' standpoint and provides a comprehensive course in general accounting for business executives and professional men who, in handling their personal affairs, must understand what bookkeepers and accountants do, what business statements mean, and how the great variety of business accounts can be analyzed to determine the actual status of an enterprise from the standpoint of profit and loss, investment values, etc. While it is intended

(Continued on next page)

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(Continued from previous page)

for general college courses, it should find a ready place on the reference shelf of business executives.

Introduction to Electrical Machines

By A. W. Hirst. Cloth, 122 pages, 5⅞ by 8¾, illustrated. Price, $2.25. Published by Chemical Publishing Co., Inc., New York City.

A textbook for students of engineering schools, technical colleges, and for practicing engineers.

The book is divided into six chapters which treat the subjects under each of the following headings: electromagnetism and electromagnetic induction, the magnetic circuit and magnetic calculations, the electromagnetic machine, insulation and insulating materials, losses — heating and ventilation of machines, wave form and harmonic analysis, and solutions.

The solutions of the problems have been added at the end of the book.

Constructional Activities of Adult Males

By W. Virgil Nestrick. Cloth, 128 pages, 6 by 9⅛. Price, $1.60. Published by Bureau of Publications, Teachers College, Columbia University, New York City.

This is an interesting account of a study to determine the factors which enter into the choice of leisure activities involving the use of hand and of power tools.

Men from different walks of life were interviewed to get a fair basis for this study.

Vocational Mathematics

By Herman G. Schumacher. Paper, 132 pages, 6 by 9, illustrated. Published by Goodheart-Willcox Co., Inc., Chicago, Ill.

This shop arithmetic provides a good review of the four fundamental arithmetical operations in whole numbers, and in common and decimal fractions, and then shows how these operations may be employed in the solution of problems met with in woodworking, machine-shop practice, auto mechanics, electricity, and mechanical drawing in industrial-arts and vocational-education classes.

There also are problems in angular measurement, simple formulas, and square root.

General Bookbinding

By Chris Groneman. Paper, 64 pages, 7¾ by 10¼, illustrated. Price, $1. Published by McKnight and McKnight, Bloomington, Ill.

This text is specially devised for any situation where a course in general bookbinding seems desirable.

The projects were chosen because of their interest appeal. The equipment may be as inexpensive or as elaborate as the instructor may think necessary, and the course can be made as comprehensive as the needs may dictate.

The illustrations clearly indicate what equipment is needed and how each operation is carried out, and the instructions are such that the beginner can readily follow.

Units in Forging and Welding

By Robert E. Smith. Paper, 56 pages, 8 by 10¾, illustrated. Price, 36 cents. Published by McCormick-Mathers Publishing Co., Wichita, Kans.

This book consists of eight informational units and 22 operating units on forging and welding. It covers hand, oxyacetylene, and arc welding. There also are directions for annealing, hardening, and tempering.

A number of projects also are shown.

Drawing Aptitude Test

By Weston W. Mitchell. Paper, 11 pages, 5⅞ by 8⅞, illustrated. Price, 10 cents. Published by McKnight and McKnight, Bloomington, Ill.

This test was devised to measure visualizing ability. It can be given to persons who have had no previous experiences or instruction in mechanical drawing. It may be used in the seventh, eighth, ninth, and tenth grades. The working time is one hour.

A manual and a key for this test is available.

Short Method of Pattern Development

By Ralph W. Poe. Paper, 47 pages, 6 by 9, illustrated. Price, 30 cents. Published by the American Rolling Mill Co., Middletown, Ohio.

Describes the laying out of funnel square to round transition piece, square to round eccentric, oval to round fitting, rectangular to round, oval to round, square to round elbow, "Y" fitting, oval to round elbow, "T" joints, off center "T," angular joints. The whole is based on a method of making forms or templates which, upon being revolved, will accurately draw out the required patterns.

Educational Objectives in Vocational Agriculture

Obtainable from the Superintendent of Documents, Washington, D. C. Published in 1940. Price, 5 cents.

ANSWERS TO QUESTIONS

NATURAL BEECHWOOD FINISH

1076. Q.: We have some beechwood furniture which we would like to keep in a tone as nearly natural as possible. Everything so far tried has changed the color of the wood quite decidedly.

Another problem which is bothering somewhat is the fact that the wood is not selected stock and shows very decided contrasts in dark and light. Is there any unifying treatment which may be used? — *M. B.*

A.: Beechwood is very difficult to finish naturally because of the great difference between the color of the heart- and sapwoods. If a light to medium brown water stain could be used in the schedule then a toner could be used as well.

This would consist of a tablespoon of boiled linseed oil stirred into one quart of gasoline and applied as a brush coat to the well-sanded and dusted wood. After drying two or three days in a warm room, the heated water stain could then be brushed on evenly and the "take" would also be uniform in color. Let dry overnight. Brush or spray on one coat of gloss four-hour floor varnish. Dry three days and then rub off with 2/0 steel wool. Clean very carefully to remove all traces of steel wool and then give a coat of flat or eggshell, four-hour floor varnish. In any case use a dull effect.

(Continued on page 42A)

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Summer Session Bulletin Sent on Request

Director of Summer Session
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Menomonie, Wisconsin

(Continued from page 38A)

In place of the foregoing, if the wood is new and unfinished, buy either DuPont or Sherwin Williams wood preservative finishes and follow the schedules on the can very exactly. This will give a most durable and satisfactory finish.—*Ralph Waring.*

1061. Q.: I have tried in vain to get information on how to finish mahogany in the warm, mellow tone found on good pieces in the best furniture stores. I have been to a number of paint and varnish factories in Chicago, but can get no definite information. Their stock stains are oil or acid stains which do not give satisfactory results. I have your *Principles of Mill and Paint Shop Practice* but it does not solve my problem.

Please tell me where I can buy these stains (nongrain raising preferred) in *small* quantities. Some U. S. firms carry mahogany stains (water) designated by number, but I have no idea what results they give and they list as many as a dozen numbers in mahogany.

I have not found it possible to get information on bleaching mahogany to get the finishes so popular now.

Another finish that I would wish to experiment with is "pickled" mahogany and "pickled" pine, but cannot get the information.

Your advice on these problems would be very much appreciated.

A.: All the information which you can possibly require to match any color of mahogany or other wood is contained in your copy of *Principles of Mill and Paint Shop Practice.* Take the book down to the furniture store which sells the color furniture you admire, open the book to the frontispiece, compare that color plate with the finished wood, determine how much redder or browner it is than the wood, make a note to that effect and then go back to your shop and match up the color sample as directed on page 156 and 157. For the small quantities that you require, the formula for nongrain-raising stain on page 157 is both correct and ample. If too red add a trace of black.

For small quantity supplies of stains and similar materials, write to Dutch Kraft Corporation, Grand Rapids Varnish Corporation, Grand Rapids, Mich. This firm puts out kits for just such purposes as yours.

In case you wish to make up your own stains, write to the Pylam Products Company, 799 Greenwich Street, New York, N. Y., and ask for their folder of water-soluble stain powders. When you receive this, check the colors you wish and the firm will send you ten-gramm samples which you can then handle as suggested in *Principles of Mill and Paint Shop Practice.*

You might just as well forget the bleached finishes as the suppliers will not make up less than five- and ten-gallon lots, which you could

(Continued on page 45A)

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(Continued from page 42A)

never use up in less than a lifetime anyway. Bleached finishes are just a temporary thing anyway since they are too exotic to be of any enduring value. — *Ralph Waring.*

NEWS NOTES

♦ On July 1, 1940, four days after the signing of the bill providing for national defense training, Kansas had 300 men in training for aircraft manufacture. This was possible because of the fact that during the summer of 1939 and 1940 the Wichita board of education, in cooperation with the State Board for Vocational Education, had been conducting such work.

Today, approximately 1800 men are in training. By July 1 of the present year, the number will have exceeded 2500. Several times this number have passed through the program and have been absorbed by industry.

♦ The fourth annual search for 10 outstanding boys with ambition to become engineers has been started by the Carnegie Institute of Technology and the Westinghouse Electric and Manufacturing Co. These high school students will be selected on the basis of competitive examinations, character, and personality to receive George Westinghouse Scholarships, each of which has a value of $3,420. Beginning next summer, the students will start a five-year "work-learn" technical study program. They will obtain practical experience in Westinghouse plants during five summer vacations and two college semesters, besides completing eight semesters of college classwork at the Institute.

♦ The Kansas State Board for Vocational Education reports that up to the present, assistance has been given to more than 30 communities in setting up related training programs for NYA project workers. More than 400 of these young people are now actively engaged in classwork. Within the next two weeks many more programs will have joined the active ranks.

♦ The Information Exchange on Education and National Defense, which has recently been organized in the U. S. Office of Education as a clearinghouse for ideas and materials on education and national defense, announces its first catalog. It lists 103 items which have been organized into 24 loan packets. Publications, posters, outlines, study units, pictorial booklets, reprints of magazine articles all touching on some defense plan or problem are listed in the catalog. They come from institutions as widely separated as Seattle, Wash., and Columbia, S. C. By discovering and using new ideas, democracy uses its resources of ingenuity. Loan packets listed are made up of materials contributed by schools and colleges, organizations, and other interested individuals and groups.

Each loan packet contains a number of different materials related to a particular topic.

A copy of the catalog listing these materials may be secured by writing to Information Exchange on Education and National Defense, U. S. Office of Education, Federal Security Agency, Washington, D. C.

♦ The High School at Henderson, Ky., has expanded its industrial-arts program to meet the needs of changed conditions.

♦ In order to meet the demand for a more practical type of training in the Senior High School, the Board of Education in Kansas City, Kans., has equipped two shops for vocational training, one for machine shop and the other for electricity. They are located at Argentine High School under the principalship of J. C. Harmon.

The machine shop is equipped to teach such fundamental units as benchwork, use of hand tools, drilling, sawing, lathe work, shaping, milling, grinding, surface grinding, and heat treating. The problems of safety are also given considerable attention. Instructor Donald Schultz has had four years' apprenticeship work and five years of experience as a master craftsman, three years in ordinary machine-shop work and two years as a tool- and diemaker.

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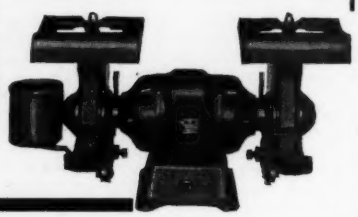

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